19

PHILOSOPHICAL TRANSACTIONS

OF THE

ROYAL SOCIETY OF LONDON.

SERIES B, VOL. 200. Pp. 271–330.

THE PROPORTION OF THE SEXES PRODUCED BY WHITES AND COLOURED PEOPLES IN CUBA.

BY

WALTER HEAPE, M.A., F.R.S.,
TRINITY COLLEGE, CAMBRIDGE.

B. 269.

PUBLISHED BY THE ROYAL SOCIETY.

INDEXES to the PHILOSOPHICAL TRANSACTIONS: from Vols. 1 to 120. Three Parts, 4to, 21s., or separately, Part I. (1665–1780) 15*s.*, Part II. (1781–1820) 7*s.* 6*d.*, and Part III. (1821–1830) 5*s.*

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VIII. *The Proportion of the Sexes produced by Whites and Coloured Peoples in Cuba.*

By WALTER HEAPE, *M.A.*, *F.R.S.*, *Trinity College, Cambridge.*

(Received September 30,—Read November 26, 1908.)

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Introduction.

THE records compiled by Dr. CARLOS J. FINLAY, Chief Sanitary Officer of the Island of Cuba, and published in the 'Informe Mensual Sanitario y Demographico de la Republica de Cuba,' contain most valuable information concerning the proportion of the sexes born by whites and coloured peoples in Cuba. They are specially valuable to the student of the problem of sex production, inasmuch as they contain details not only of legitimate and illegitimate births but also equally full details of legitimate and illegitimate stillborn children (information which is not to be obtained in this country, and which, I may add, I have failed to induce our home authorities to attempt to supply in their publications); and because they deal with two races living on an island under similar conditions, the records for each of which are kept separate.

Dr. FINLAY, to whom I am greatly indebted for his courtesy in supplying me regularly with this publication, is careful to inform me that the figures in the tables referring to stillborn children, "in accordance with the Spanish law, do not only express the number of children that are actually born dead but also those that die within the first twenty-four hours after their birth." This fact does not detract from the value of these records for the purpose I have in view, but it should be noted.

Speaking generally, there is undoubtedly a very remarkable regularity in the proportion of the sexes produced by various species of animals of which records have been obtained, a regularity which is so pronounced that students of heredity are surely justified in their belief that the laws of heredity are certainly concerned and, in the main, govern that proportion. The fact that this proportion is different for different species or for varieties of those species, while in the main stable for each, is favourable to that view, and I shall bring forward evidence in this paper which cannot, I think, be interpreted otherwise.

DARWIN (1871) concluded "that natural selection will always tend, though sometimes inefficiently, to equalise the relative number of the two sexes." The tendency of natural selection, as the master shows, must undoubtedly work in this direction, but from my small experience I cannot but judge it very rarely succeeds in effecting this result.

But, notwithstanding hereditary tendencies and in spite of natural selection, there are, continually recurring, variations in the proportion of the sexes produced by different species or varieties of animals. DARWIN remarks upon it and considers it is due to "unknown causes." The examples he had to refer to he designates as slight variations, but we have somewhat more complete details at our disposal now and it is evident such variations may be very distinctly marked.

When it is sought to account for these, either by the laws of heredity or of natural selection, it seems to me those who have attempted to do so conspicuously fail; and I am induced to maintain that such variations are not thus regulated but are governed by other conditions, in the main nutritive or physical conditions, which affect both the vitality and the life of healthy ovarian ova and developing embryos, either directly or through the mother which bears them.

I have advanced this view in certain recent publications for rabbits (1905), dogs (1907 A), and canaries (1907 B), and I believe the evidence I now offer will serve to show that the proportion of the sexes produced by any human race is to some extent influenced by the conditions under which that race lives.

An exhaustive discussion on the sex problem would here be out of place, but it is necessary I should refer briefly to certain aspects of that problem. The chief interest regarding the problem of the sexual differentiation of the individual lies in the determination of the part taken by the ovum and spermatozoan in conferring sex, and so far this problem has not been solved.

The histological work of McClung (1902), Wilson (1905–6), and others concerning the diagnostic value of variations in the chromatin elements in the nucleus of spermatozoa is of great interest in this respect. Wilson believes that the two groups into which spermatozoa may be divided in consequence of such variation are groups of male and female spermatozoa; but, although it cannot be denied he has strong evidence in favour of this view, the proof that he is right is still wanting.

In the same way, although the sexuality of ova is no less probable, Doncaster (1908) shows they are in some cases readily recognisable, no satisfactory evidence is forthcoming as to the histological differentiation of ovarian ova which permits of their division into male and female ova. Russo's (1907 a) recent attempt to show this I have dealt with elsewhere (1908); in my opinion he fails to prove his case.

Perhaps the most hopeful attempt yet made to solve this problem is to be found amongst the works of the Mendelians. Castle (1903) and Bateson (1906) both treat of it, but the published experimental work of Doncaster and Rayner (1906) and Doncaster (1907) is conspicuously valuable in this respect.

It has long been held by practical breeders that particular characteristics may be inherited by the progeny of one sex only, and recent Mendelian investigations have shown that, in accordance with this law of heredity, light may be thrown upon the dominant power of the ovum or of the spermatozoan in conferring the sex of the progeny.

From Doncaster's results the conclusion may be drawn that the sex born by the ovum dominates that born by the spermatozoan (a conclusion with which Bateson (1908) is disposed to agree so far as vertebrates are concerned), and, further, that—as Castle has argued—female ova can only be fertilised by male spermatozoa and, *vice versâ*, male ova by female spermatozoa. Wilson's work is in conformity with this view and, when his results are considered in relation to those Doncaster published, strong support is given to the theory that the zygote is of dominant sex in accordance with the sexuality of the ovum. In my paper on dogs (1907 a), I have suggested this, and pointed out that it involves the supposition that all individuals are possessed of a recessive as well as a dominant sexuality, a supposition which is, I think, abundantly justified, no matter from what point of view the problem may be considered.

It may be argued that the theory that ova can only be fertilised by spermatozoa of the opposite sex involves the hypothesis of selective mating and that this is a stumbling block.

It does not appear to me there is any just reason to so regard the selective mating of germ cells. It must be remembered there are an enormous number of spermatozoa available for the fertilisation of each ovum, and, moreover, it will be recollected there are undoubtedly chemotactic properties associated with ova (Farmer

1907) which insure that ova of different species floating in the sea shall each be fertilised by spermatozoa of the same species, so that to grant there is a still more delicate chemotaxis at work is not an illegitimate but is indeed a reasonable supposition.

In dealing with human beings, as with all animals in which only a small proportion of the ova contained in the ovary come to maturity, we are dealing with animals whose ovarian ova are subject to a struggle for existence, with animals in which selective action goes on in the ovary. Histological examination demonstrates that for some reason or other one ovum will degenerate while its neighbour thrives, and it seems probable there are a variety of forces which may exert influence in this respect.

I have drawn attention to this in my paper on the rabbit's ovary (1905), and it is a very important fact, for, in extending to the ovary influences which bear upon selection and the struggle for existence, forces are introduced which must profoundly affect not only its power of production but also the proportionate production of ova of different constitution. Thus, this factor will not only bear upon sex but also upon every hereditary constitutional variation which is directly associated with the vigour of the ovum, and may after all in such case be natural selection.

Russo, in the paper already referred to (1907 A), and in a more recent one (1908), shows how eagerly ovarian ova seize upon specially nutritious food. He used lecithin for the purpose, and it would appear, from the figures he gives, there is a distinct variation in the capacity of different ova for the absorption of this food. Whether this variation in the power of absorbing nutriment is a sexual characteristic or not he does not satisfactorily show; indeed, the histological evidence he offers leads me to believe he is, in some cases, dealing unknowingly with degenerate ova, and this portion of his paper I judge is not wholly to be relied upon. The statistics he offers indicate that such may be found to be the case, and that feeding the mother with lecithin may result in the birth of a very marked excess of females. But what looks at first sight to be clear proof of this is found to be open to grave suspicion, for the instances he makes use of, both in his original paper (1907 A) and in a further one (1907 B) dealing with the same subject, appear to be selected cases, and it is impossible to be assured they are truly representative (*confer* Bateson, 1908).

But however this may be from a sex point of view, the fact remains that he shows a variable power of assimilation among ovarian ova.

Regarding the relative power of vitality of the sexes, it is true that, so far as our present knowledge actually shows, there is no surety that fertilised ova of either sex are specially subject to death in their early stages of development. For this reason it may be claimed that the premature death of embryos while in the egg does not appreciably affect the ratio of the sexes produced by any animal.

I am disposed to believe that further physiological enquiry will show that this view is wrong. Manuscript notes by the late Sir Everett Millais in my possession indicate that bitches artificially inseminated have a tendency to produce an increased proportion of males, and my own experiments on the transference of impregnated ova from one rabbit to another show that all of those embryos which were subsequently born were males. Thus it is not improbable that female ova will be found to be more delicate than male ova as a rule.

There are many records of experiments which indicate that the death-rate of larvæ of different sexes varies in accordance with the nature of the food supplied, and all of them are in favour of the view that females are less able to resist hardship and want than male larvæ (see DÜSING, 1884). Thus it may well be that the food supplied to the embryo while still in the egg may be responsible, possibly to a very large extent, for the proportion of the sexes which survive and which emerge therefrom.

But precisely as larvæ of different sexes exhibit variation in their power of living when supplied with particular food or when subject to special physical influences, so embryos born by viviparous parents may be similarly affected by the nutriment supplied to them by the mother and by the physical conditions which affect her health and vitality; and not only embryos but the life of the sexual ovarian ova themselves may similarly be so proportionately regulated.

In my paper on the rabbit's ovary (1905), I have advanced evidence which is not unfavourable to that view, and if it be so it is not unreasonable to conclude that it is the female ova which specially suffer if the food supply is not nutritious enough or in sufficient abundance. Here, again, DÜSING'S results (1891) are very strongly confirmatory, for he brings overwhelming evidence to show that while want and privation are constantly correlated with an increase of male births, prosperity is associated with an increase of female births; that while starvation and an unfavourable climatic condition are inimical to the development of females, a plentiful supply of nutritious food and specially favourable physical conditions result in the survival of an increased proportion of that sex.

A long list of papers could be given in which DÜSING'S opinion is supported; he himself gives additional evidence in other publications (notably 1884), and WILCKENS (1886, etc.), NUSSBAUM (1880, 1896, 1897), SIMON (1883), CLEISZ (1889–1895), SCHROEDER (1890), WACHTL (1891), MAUPAS (1891), WESTERMARCK (1891), HENNEBERG (1897), MOLLIARD (1898), ANCEL (1902), LENHOSSÉK (1903), GREGORY (1904), ANNANDALE (1906), FREIHERR (1906), HERTWIG (1906), and ISSAKOWITSCH (1906) are a few of the names of those whose observations and judgment in my opinion serve to substantiate, in the main, his results.

DÜSING himself is indeed so strongly impressed with the effect extraneous influences exert upon sex proportions, that he is disposed to deny that heredity is in any way concerned therein, a conclusion with which many of his contemporaries agreed and which is not without its supporters in the present day (HERON, 1906). This view appears to me to be as untenable as that held by others, both before and since Düsing's time, who claim that heredity is the only agent we have to deal with.

Punnett (1906) has recently published the results of careful experiments on Hydatina which led him to conclude that Maupas' and Nussbaum's observations on the same animal were wrong. I think he is right inasmuch as he shows these authors claim too much ; but a comparison of his results with those of Maupas and Nussbaum appears to me to show not that external influences are without effect, as he apparently claims, but that they are not the only forces which exert influence on the proportion of the sexes produced by this animal. I quote Punnett as an example of those who deny the effect of such influences ; the work of all who hold that view, which I have examined, I judge to be open to a similar criticism. Personally I do not claim that physical conditions are the only forces which determine the proportion of the sexes, but I hold there is overwhelming evidence in favour of the view that such proportion may be modified by their agency, sometimes to a very considerable extent. Many opponents of the nutrition theory, as I understand it, disregard what I consider to be an essential part of it, which is, that it depends not solely on the amount or quality of nutriment supplied to the mother but on her capacity to assimilate what is supplied and on her power or her disposition at any given time to transmit it to the ovary.

Punnett (1903), for instance, collected information of the sex of children born by poor and rich people, and he claims that while among the poorer class there are no more than 101 M. per 100 F. children, among the rich the proportion of M. rises to 107·6, and he infers from this that if nutriment has anything to do with the matter it is the *more* favourable conditions which favour the production of M., not privation as Düsing believes.

At the same time Punnett finds from an analysis of nine years' records of Queen Charlotte's Lying-in Hospital that (inclusive of still-births—which may perhaps be calculated at 1·5 excess M.) 109·4 M. per 100 F. were born there, and in Lambeth Lying-in Hospital 107·5 M.—and the patients there are poor women.

I would point out that the indolent life so frequently led by rich women and the ailments they so often suffer from in consequence of over-feeding with rich food are opposed to vigorous metabolism and not favourable to ovarian nutrition. His conclusion regarding this matter is, I apprehend, based on wrong premises, and the only true test for the nutrition theory is the determination of the effect of a different kind of feeding on the same individual or, if in masses, on the same class of individual, at different times.

But nutrition is not the only factor to be considered : the more one studies this question the more clearly it appears to be established that a variety of forces take part in the production and the survival of individuals of one or the other sex, and I think this conclusion must be admitted before any decisive advance can be made in our knowledge of the subject.

For instance, there is no doubt that the proportion of the sexes born by domestic animals (cattle, sheep, park-deer) during different breeding seasons varies considerably; it is not infrequently remarked by breeders in a certain district, this is a bull or heifer year. Again, it seems highly probable that a particular dietary may have influence on the proportion of the sexes of young born by domestic cattle during a certain breeding season.

It does not appear to me reasonable to doubt that the circumstantial statements made on this matter from time to time are true to this extent, viz., that a particular method of feeding the mothers is associated with a marked increase of one or the other sex in the total progeny of one season's breeding.

At the same time it is quite clear that the same method does not always produce the same result, and for this reason such evidence has been, I think unjustly, discarded. It must be recollected we are here dealing with foods the quality of which varies in accordance with climatic and many other conditions incident to their growth; what would usually be considered by the breeder as "the same food," may indeed be very different in consequence of the different conditions under which it was grown. Similarly the climate anterior to and at any two breeding seasons is doubtless different, and the health, vitality, power of metabolism, etc., of the animals themselves is also different.

Thus it is clear that while there is ample reason for the constant failure to repeat the same result year by year, it does not necessarily follow this is proof that the nature of the food supplied to the mother, her power of assimilation, and the readiness with which she transmits nutriment to the ovary, are negligible quantities with regard to this problem.

On the contrary there is, in my opinion, sound reason for the conclusion that, in all animals in which only a limited number of ovarian ova come to maturity, selective action takes place in the ovary and that the growth and maturation of male or female ova are directly influenced by the quality or quantity of nutriment supplied to the ovary.

Assuming, then, that the sex of the embryo is derived from the ovum and that spermatozoa of the opposite sex are required for its fertilisation, we must look first to the mother for the causes which induce variation in the proportion of the sexes produced.

But, since it is conceivable that a variety of causes might induce the male to produce spermatozoa of only one sex, it is clear that in such case only ova of the opposite sex would be fertilised. Thus in spite of the production of ova of both sexes by the mother, the offspring born may be of one sex only, and the responsibility for this may lie with the father.

It does not seem improbable that the large proportion of foals of one sex which it is stated are got by certain stallions out of a large number of mares may thus be explained, and that the results which may attend the mating of individuals of a hybrid race *inter se* are to be referred to this cause (BROCA, 1864). Such cases are, however, rare and it would appear that the most prominent place in all questions concerning sex ratio is occupied by the woman. It is in their relation to women that the value of the results arrived at in the following paper, in the main, lies.

The Physical Features of Cuba.

The long narrow Island of Cuba stretches from 74° to 84° 59′ west longitude, a length of 730 miles, while its width is between 20 to 90 miles in north latitude 19° 49′ to 23° 15′. The total area of the island is from 40,000 to 43,000 square miles.

VAUGHAN and SPENCER (1902) divide the island into five districts. Three of these are mountainous, viz., the western part of the province of Pinar del Rio (at the west end of the island), the eastern part of Oriente (at the east end of the island), and part of Santa Clara (in the centre of the island); while two are low regions with rolling plains and a few low hills, and they divide the central mountainous portion from the western and eastern mountain regions respectively. By far the most mountainous district is that at the east end of the island in the province of Oriente.

The coast is almost invariably low lying, especially along the southern side, where large tracts of swamp are found.

The climate is variable in different districts, tropical in the low-lying districts, the low coast land being described as torrid; while among the hills, over 300 feet high, it is much more temperate, and in the higher parts the temperature may reach freezing point in winter.

There are two seasons, a hot wet season from May to October, and a cool dry season from November to April. Rains, however, may fall every month of the year, and in Habana the wet season is credited with 27·8 inches, while in the dry season 12·7 inches fall.

Generally speaking, the rainfall is greater inland and less on the south coast.

The temperature in Habana during July and August ranges from 88° to 76° Fahr., the average being 82°, while in January and December the range is from 78° to 58°, and the average is 72°. Inland, and on the south coast, the temperature is higher than at Habana where, in common with the whole of the north coast, the prevailing north-east trade-winds temper the climate.

In the most western portion of the island, moreover, cool north winds blow from time to time during November to February, and still further reduce the heat there.

In the census returns for 1899, it is stated, 38·3 per cent. of the population live at an altitude of less than 100 feet, 53·1 per cent. between 100 feet and 1000 feet, and 8·6 per cent. at a height of over 1000 feet.

The physical features of the island, its geology and climate, are treated of by HILL (1898) and another writer in the same journal ('Cuba,' 1906), by ROWAN and RAMSAY

(1898), and in two articles in the 'Encyclopædia Britannica' (vol. 6 and vol. 27), and I may mention here that my knowledge of the social, agricultural, commercial, etc., life of the inhabitants is largely derived from two American publications (Census 1899, and 'Commercial Cuba,' 1903), and a few articles in French journals.

Concerning agriculture, it is only necessary to add that not more than 25 per cent. of the land was under cultivation in 1900, that most of it was under sugar (chiefly in Santa Clara and Matanzas); while tobacco, which ranks second, is chiefly grown in Pinar del Rio (Cuba, 1900).

The history of the "Pearl of the Antilles" is the history of a wonderfully productive island colonised by the Spaniards in 1512, and exploited by them very largely with the aid of slave labour until 1880, when the slave trade was finally suppressed.

Since 1883, uprisings among the negroes, followed later by insurrections organised by native whites, of Spanish blood, have been frequent, and it was only after 76 years, in 1899, that the island became free from internecine strife. Since that date great strides have been made, and the loss in population of 3·6 per cent., which occurred between 1887 and 1899, is already far more than regained. This loss of numbers occurred exclusively in the west, the most populous half of the island, the eastern half actually gaining during that period, and, as will be seen below, the largest gain since 1899 has taken place also in the eastern provinces, though, largely in consequence of immigration, the western provinces have also substantially gained (Table II).

Cuba is divided into six provinces, and these are again subdivided into districts for purposes of administration, as follows:—(1) Pinar del Rio, with 12 sub-districts; (2) Habana, with 18; (3) Matanzas, with 10; (4) Santa Clara, with 21; (5) Camagüey, with 5; (6) Oriente, with 16 sub-districts.

The provinces occur in the order given from west to east and are, roughly, slices right through the long, narrow island.

The Population of the Island.

The population is roughly divided into whites and coloured peoples. The whites are chiefly of Spanish descent, 57·88 per cent. (910,299) of the whole population being "native" whites, that is, whites born on the Island, while only 9·03 per cent. (142,098) are foreign whites, immigrants, and these are mostly concentrated in Habana city (Census 1899).

The coloured people are about equally divided into negroes and "mixed." Together they amount to 32·14 per cent. of the total population (Census 1899), almost all of which are native born. I find no details of the "mixed" coloured people; from general statements it may be inferred they are products of Spanish and negro unions which occurred two or more generations ago, and from marriage statistics it is certain white fathers are more common than white mothers.

By far the largest number of mixed coloured people live in the east of the Island. Oriente has nearly double the number found in any other province, namely 98,323; Santa Clara with 58,050, and Habana with 53,479 coming next in order, leaving 60,953 to be distributed over the remaining three provinces (Census 1899).

The remaining 0·95 per cent. (14,857) are Chinese, chiefly old men, Chinese immigration having practically ceased since 1873.

The Census of Cuba, made under the supervision of the War Department of the United States in 1899, just after the independence of the Island had been declared, and during the period of American occupation, shows a total of 1,572,797 inhabitants, as follows:—

Table I.—Census of Cuba, 1899. Nationality.

Native white	910,299	
Foreign white	142,098	
Chinese	14,857	
Total white	—	1,067,254
Negro	234,738	
Mixed	270,805	
Total coloured	—	505,543
Total	—	1,572,797

It is to be noted the Chinese are included among whites in accordance with the custom of the Spaniards in previous census returns; as the Chinese represent less than 1 per cent. of the whole population, it is claimed their inclusion among whites is not a matter of importance.

Another Census is being taken but has not yet been published; for the years 1904–6 the figures given by Dr. Finlay may be taken as approximately correct, viz., 1,776,652, and it may be assumed that, in accordance with the last Census, 68 per cent. of the population are white (1,208,123) and 32 per cent. coloured (568,529). The distribution of the population is as follows:—

Table II.—Comparison of Census 1899 and FINLAY'S Estimate. Provinces.

Provinces.	FINLAY'S estimate.	Census 1899.	Difference.	Per cent. increase.
Pinar del Rio	186,205	173,064	13,141	7·59
Habana	480,853	424,804	56,049	13·19
Matanzas	222,880	202,444	20,436	10·09
Santa Clara	401,852	356,536	45,316	12·71
Camagüey (Puerto Principe)	101,887	88,234	13,653	15·47
Oriente (Santiago)	382,975	327,715	55,260	16·86
Total	1,776,652	1,572,797	203,855	12·96

In the province of Pinar del Rio there is one sub-district with a population of 38,172 (Pinar del Rio), but none of the others reach 25,000.

In Habana, one sub-district (Habana) has 280,000 inhabitants, another has 27,795, but none of the others reach 25,000.

In Matanzas, only two sub-districts have over 25,000, viz., Matanzas 61,880, and Colon 49,030.

In Santa Clara, one sub-district has 64,019 (Cienfuegos), and four others have a population ranging from 26,772 to 34,546 (Santa Clara).

In Camagüey, only one sub-district has more than 12,000, viz. Camagüey, with 61,046.

In Oriente, there is one with 52,220 (Manzanillo); one with 49,893 (Santiago de Cuba); and five others ranging from 25,630 to 42,704 (Holguín).

Most of the subdivisions with the largest number of inhabitants are on the coast, seaport towns and their surroundings, and the Census returns for 1899 show that the towns containing 8000 or more inhabitants absorb 32·3 per cent. of the total inhabitants, a very high proportion.

The figures given by FINLAY do not show the proportion of the sexes of adults in the different provinces. I have therefore added here a table drawn up from the Census returns which supplies that information for the year 1899 for both whites and coloured people, as it will be of value in future discussions.

Table III.—Census 1899. Provinces, Race, and Sex.

Provinces.	Whites.			Coloured.			Total.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.
Pinar del Rio . .	68,595	57,633	126,228	23,093	23,743	46,836	91,688	81,376	173,064
Habana	174,805	141,671	316,476	47,185	61,143	108,328	221,990	202,814	424,804
Matanzas	66,373	55,750	122,123	37,353	42,968	80,321	103,726	98,718	202,444
Santa Clara . . .	137,279	112,683	249,962	51,778	54,796	106,574	189,057	167,479	356,536
Camagüey (Puerto Principe)	36,536	34,323	70,859	8,363	9,012	17,375	44,899	43,335	88,234
Oriente (Santiago) .	94,219	87,387	181,606	69,626	76,483	146,109	163,845	163,870	327,715
Total . . .	577,807	489,447	1,067,254	237,398	268,145	505,543	815,205	757,592	1,572,797
Per cent. M. and F.	54·14	45·86	—	46·96	53·04	—	51·83	48·17	
,, Race . .	—	—	67·86	—	—	32·14	—	—	100·0
M. per 100 F. . .	—	—	118·05	—	—	88·53	—	—	107·6

Thus, in 1899, the whites are in the majority in all the provinces; the coloured element is largest in Oriente (44·58 per cent.), while it is shown that the Chinese element is so small in any province that it may be disregarded. Reference to previous Census returns shows that the proportion of coloured to whites has diminished in the last half century. In 1861, coloured numbered 603,046 against whites 793,484, from which fact it is held that we have here another illustration, still more obvious in the United States, of the inability of an inferior race to hold its own in competition with whites (Census 1899). This conclusion, I will show below, requires some modification. It would seem probable that while the great increase of whites is, to some extent, due to immigration, the reduction of coloured people has been largely effected by the abolition of slavery, and that where the existing coloured population fail to maintain their position the cause is to be ascribed more to the conditions under which they are allowed by the governing white class to live rather than to any inherent inability to compete with them.

GALLENZA (1873) describes the native whites in Habana as poor creatures, both morally and physically, and I find little in more modern works to lead one to suppose there was any great change in those inhabiting the towns up to the time of the war. In the country districts, however, the native white is a very different person, and there can be no doubt a large proportion of them are of sterling worth and character.

On the other hand, it is claimed (Census 1899) that the condition of the coloured people in Cuba has for many years been better, and their personal privileges greater, than is the case in America, while their power of work, temperance, frugality, and intelligence is borne witness to. With the increased prosperity, which it seems probable the Island will experience, the position the coloured people occupy will enable them to progress, and the power of fertility they possess is a factor to be reckoned with in estimating their ability to compete with whites in the climate they both have to live in.

In this relation, WOODRUFFE'S (1905) conclusions regarding the negroes of America are worthy of consideration. He believes that the negro is fated to die out in the United States, not because he is inferior to whites but because the climate is inimical to him. If this is true it would seem, from statistics of sex production, the struggle for existence will be harder on the white than on the coloured race in Cuba.

The highest total population hitherto recorded was in 1887, when there were 1,102,889 whites and 528,798 coloured, a total of 1,609,075 inhabitants. The loss since that date to 1899 (3·6 per cent.) is entirely confined to the four western provinces, the two eastern provinces having actually gained in population since 1887, and is attributed to the results of the recent war and the continuous internecine strife which preceded it for so many years.

The Sex according to Census Returns.

So far as sex is concerned, it is shown that the proportion of males was at a maximum in 1841 (58 per cent.), since when it has decreased; that in 1899 such excess occurs mostly in the four western provinces, probably owing to an excess of male immigrants to those parts, the two eastern provinces having nearly equal proportions of the sexes; and that the excess of males occurs only in rural districts: in all towns, with the exception of Habana (again owing to immigration), females are more numerous than males.

It is important to note that the excess of males is entirely confined to whites, and that females are in excess among coloured people.

Galton (1874–75), after examining documents communicated to the Anthropological Institute by the Colonial Office, found there was a considerable excess of females in the West India Islands, but declared this was due not to an excess of females born, the male births being in excess, but to excessive mortality among young males, to emigration of males (from most of the Islands), and to importation of women for purposes of prostitution (to one island—St. Thomas').

In Cuba, the grand total shows an excess of males, the total for whites also an excess of males, but the total for coloured an excess of females. (Table III.)

In the case of the whites, this excess of males is entirely due to immigration. It is true the male birth-rate is higher than the female, but the male death-rate is much more in excess of that of the female, and native born white women are in excess. The only countries from which an excess of female immigrants come are Porto Rico, West Indies, and Mexico, the total excess being 326.

In the case of coloured people, the excess of females is not due to recent immigration. There is a small excess of coloured female immigrants from Porto Rico and Mexico (83 excess females), but it is much more than balanced by excess of male immigrants from all the other countries from which they come. Neither will the death-rate, which is higher for coloured females than it is for males, account for the excess of coloured females, while the birth-rate is almost exactly equal as regards sex. And yet, as is the case for whites, the native born coloured women are in excess.

The fact that females are now in excess, both among white and coloured native born, leads me to suggest that the war is responsible for this result. I can find no evidence of any other cause which will explain it, and feel confident it cannot be attributed to any of the causes which Galton found sufficient to account for the excess of females in the West Indies.

Marriage.

Marriage has decreased since 1861, when 16·5 per cent. of the population were married people, to 15·7 per cent. in 1899, and there has also been a decrease in the number of children born; but it is of great interest to observe that in spite of the relative increase of females the decrease of marriage is proportionately greater than is the decrease in the production of children.

In all great countries in Europe, except Ireland and Scotland, it is stated, the proportion of married to the total population is at least twice that of Cuba. (Census 1899.)

Illegitimacy.

In the returns dealt with in the following pages it will be observed that a considerable proportion of the children born by white parents (18·72 per cent.) and a majority of those born by coloured parents (65·78 per cent.) are illegitimate children.

A return has been made in the 1899 Census in which a class of persons is recognised who are living together by mutual consent, and it is stated that 8·4 per cent. of the inhabitants are included in this class.

It would seem that in some cases such "consentual unions" (as the United States officials have called them) are permanent, but that they are by no means always so, and for that reason it does not appear probable that much reliance can be placed on the detailed figures given in the Census Report.

Generally speaking, however, it may be stated that among whites there are 23 consentual unions for every 100 marriages, while among coloured people 250 consentual unions per 100 marriages is about the proportion met with.

Thus for whites, whereas 32·34 per cent. of the population over fifteen years of age are married, only 7·54 per cent. live together by mutual consent, while for coloured people there are 9·57 per cent. married and 24·57 consentual unions. Taken together, the Census recognises the sexual union of 39·88 per cent. of the white and 34·14 per cent. of the coloured population over fifteen years of age, which is a much lower proportion than is recorded for the United States.

The proportion of single persons is not only higher than in the United States, but is higher than in any other country known to statistics. Moreover, the proportion of single persons does not decrease steadily from youth to old age as in the United States. A minimum of single persons is reached between 45 and 54 years for males and between 35 and 44 years for females, and the increase of single persons after those ages is accounted for by the inclusion in that class of many of those who at one time lived together by mutual consent.

The increase in the proportion of single persons with advancing years is largely confined to the coloured race, as would be expected if the explanation given above is the true one.

Consentual unions are found to be more common in rural districts than in cities for both races; they are proportionately most frequent in the rural districts of Matanzas and Oriente, in which two provinces there is by far the highest proportion of coloured people; the cities of Pinar del Rio, where there are many persons of both sexes employed in the tobacco factories, and Habana being exceptions to this rule.

I have entered somewhat fully into these details of legal and consentual unions because, as I will show below, there is a very remarkable difference in the proportion of the sexes of children classed as legitimate and illegitimate in the tables hereafter dealt with.

This difference is so consistent in the returns I deal with for Cuba, and is in such close conformity with similar records for various other countries, that it cannot be doubted it attains the dignity of a law. In conformity therewith I should undoubtedly judge that the "consentual unions" recognised in the Census are certainly not to be regarded as permanent unions, and, indeed, I would express the opinion they are by no means so frequently permanent as the Census officials, here and there in their reports, seem to believe.

Deaths.

Deaths will be treated of more fully in the body of the paper; it is only necessary here to call attention to the fact that while the proportion of living whites is 115·09 males per 100 females, the proportion of deaths is 129·76; whereas, on the other hand, the proportion of living coloured is 93·95 males per 100 females, the proportion of deaths is 92·2; a result which would seem to be not unfavourable to the view already expressed as to the ultimate persistence of the coloured race in Cuba.

The Proportion of the Sexes produced by Whites and Coloured Peoples in Cuba.

The returns dealt with are for the years 1904–5–6, and, throughout, those for whites and coloured peoples are kept separate. I have, in the first place, tabulated for each month, for each year, and for each province—under headings of Male, Female, Total, and Males per 100 Females—the figures given for Births (legitimate and illegitimate), Total Births, Still-births (legitimate and illegitimate), Total Still-births, Total Production (Births and Still-births), and Deaths; and have added to these the number of Marriages (36 tables). I have then treated in the same way the totals given for the whole Island for each month of each year (six tables), and finally have summarised the yearly returns. Thus I have 43 tables to refer to for this section of the paper, the final one only being presented here as Table XIV.

During 1904, and very occasionally in 1905, the returns for some of the outlying sub-districts did not always include full information each month for all the various headings I have enumerated above. In the first series of tables I have eliminated all returns which were not complete, and for that reason my figures differ slightly from those given in the published reports.

The second series, the totals for the whole Island, being taken from the published totals, are not therefore exactly in accord with those which result from the totals obtained by me for each district. The difference when treated in the totals is so exceedingly small, however, that I judged it was not worth while to make a wholly new series of separate elaborate tables and calculations, and I have, therefore, adopted for the totals those given by the chief sanitary officer of the Island. On the other hand, where special provinces or districts are treated of month by month, or year by year, my own figures are used.

In Table XIV there is set forth the totals for the whole of Cuba for the years 1904–5–6, for both white and coloured peoples, and it indicates at a glance the leading points which this investigation shows.

Births.

For whites the legitimate births show a high proportion of Males, especially for 1906, when the proportions of Males per 100 Females born rises to 109·53, the average for the three years being 107·78. The excess of M. among illegitimate children is not so great, the average being 104·4, and it is interesting to note that the proportion varies each year precisely as it varies among legitimate births, being highest in 1906, lowest in 1905, and intermediate in 1904. When legitimate and illegitimate births are added together the average for the three years is 107·14 M. per 100 F.

The illegitimate births amount on an average to 18·72 per cent. of the whole, which is about 10 per cent. higher than the average for European countries (SUNDBÄRG, 1906).

For coloured people there is a remarkable difference under these headings. The average production of M. per 100 F. among legitimate births is 106·76, only 1·12 lower than for whites. The greatest difference between the two races under this heading is for 1904 (2·95), while for the other two years it is less than 0·5 (0·09 and 0·46).

For illegitimate children, however, there is a very marked decrease in the proportion of M. born. The average proportion for the three years is 96·76 M. per 100 F., and, as the illegitimate births amount on an average to 65·78 per cent. of the whole, the proportion of M. in the total births is seriously affected and amounts to no more than 100·07 per 100 F.

This reduction in the proportion of M. among illegitimate coloured children is remarkably consistent in the totals of the three years under review, varying only from 95·56 to 97·86, and is characteristic of the results obtained for each province. In my 18 tables (three annual returns for six provinces), only six of them show a higher proportion than 100 M. per 100 F. : namely, 100·33, 101·51, 101·7, 102·62, 104·18, and 113·04 ; and in the latter case the total illegitimate births in that province only numbered 196 for that year.

For comparison of legitimate births I have taken a four years' average for 29 countries and states and find it to be 105·6 M. per 100 F. ('Statistique,' 1894) ; of these, one (England) has less than 104, 10 have less than 105, 13 less than 106 ; Connecticut is recorded as having 107·2, Portugal 107·5, Roumania 107·7, Spain 108·3, and Greece 118 (compare ELLIS, 1897).

Thus the average for white legitimate births in Cuba is in close agreement with the figure given for Spain, the country from whence most whites in Cuba originally came, and here probably is demonstration of the influence of heredity on sex proportions..

In connection with these figures it is to be noted that the high proportion of M. recorded for Greece is so remarkable, one is inclined to doubt the correctness of the figures. They are not, however, without parallel, for DARWIN (1871), commenting on the large excess of boys borne by Jews, records that this race in Prussia produces 113, in Breslau 114, and in Livonia 120 M. per 100 F. If it is true, as alleged, that Semitic blood is present to a very considerable extent in Mediterranean nations, the figures given for the last four nations in my list may also be due to hereditary influence. (Compare DILLON, 1897, also NEWCOMB, 1904, who gives a very different estimate of the proportion of the sexes among Jews.)

There are but few records from other countries to aid as a comparison with the total births of coloured people in Cuba. WAPPAEUS (1861) records 98·53 M. per 100 F. for blacks in Venezuela (1840–1847), and NEWCOMB (1904) states that the Census returns show 99·8 for the negro race in the United States and 98·81 for negro children under one month old. Allowing for an increased death-rate of young males, this latter figure is not far removed from my birth figures, but the 1899 Census for Cuba shows a much larger proportion of adult F. than these authors give, namely, 88·53 M. per 100 F. (Table III). But, as I have before remarked, there may be special reason for this scarcity of M. after the war.

As regards illegitimate births, the same close agreement between whites in Cuba and Spain does not hold. The average for four years for Spain is 107·9 against a three-year average of 104·4 for Cuba. Indeed, the increased proportion of F. in illegitimate as compared with legitimate births among whites in Cuba is exceptionally great.

But if this difference is great for whites it is vastly greater for coloured people, amounting among the latter to no less than 10 M. per 100 F.

I have no record of anything like such a variation in any country except Greece, where 105·9 illegitimates is recorded, which, as compared with 118 for legitimates, makes a difference of 12·1 M. per 100 F. At the same time the very high average proportion of F. actually produced by coloured peoples in Cuba as a result of illegitimate unions (96·76 M. per 100 F.) is without parallel in any country the statistics of which I have seen.

In this connection it will be recollected that, in accordance with the Spanish law, children who die within the first 24 hours after their birth are included among stillborn children, and it may be thought that this difference in the sex proportion of illegitimate as compared with legitimate births in Spain, as compared with Cuba (whites), may be accounted for by a considerable excess of M. deaths, within the first 24 hours after birth, of illegitimate stillborn children. But this return is made in accordance with the Spanish law and therefore, so far as Spain is concerned, such argument will not apply. With regard to other countries it might do so; and Table XIV certainly shows a very marked increase of M. in the total still-births.

But Table XIV also shows that, instead of an increased *proportion* of M. in illegitimate as compared with legitimate stillborn children, there is a decreased proportion recorded, and, in fact, the figures for stillborn children apparently accentuate this increased production of F. in consequence of illegitimate union.

At the same time, when legitimate births and still-births are added together and compared with a similar total result for illegitimate births and still-births, the difference between the proportion of M. produced by these two classes of union is slightly less than it is for births alone.

I have shown this in Table IV, from which it would appear that the high proportion of M. produced among still-births more than counterbalances the apparent differences shown in Table XIV, and is responsible for this result.

Table IV.—Proportion of M. and F. produced by Legitimate and Illegitimate Unions. Births and Still-births combined.

Race, etc.	M.	F.	M. per 100 F.	Difference between the two classes.	Difference between legitimate and illegitimate births only.
Whites, legitimate	57,466	52,721	109·0	3·05	3·38
„ illegitimate	13,218	12,476	105·95		
Total . . .	70,684	65,197	108·42		
Coloured legitimate	7,314	6,789	107·73	9·82	9·94
„ illegitimate . . .	13,714	14,006	97·91		
Total . . .	21,028	20,795	101·12		

It has been frequently stated, and I think it is generally believed, that the proportion of F. born among illegitimate children is usually higher than among legitimate children.

Darwin (1871), in discussing the proportion of the sexes from data collected by him, remarks that it is mysteriously affected by the circumstance of the births being legitimate or illegitimate, that in different nations, under different conditions and climates, in Naples, Prussia, Westphalia, France, and England the excess of M. over F. is less among illegitimate than among legitimate children.

Prevost (1829) gives 16 separate returns for various European kingdoms, in every one of which there is a marked increase in the proportion of F. among illegitimate as compared with legitimate births. The average of these 16 returns shows 106·06 M. per 100 F. for legitimate and 102·54 for illegitimate births, *i.e.* 3·52 in favour of F. among illegitimate births (in Table IV it is 3·38).

Again, in the article above quoted ('Statistique,' 1894), details are given for 27 countries and states for four years, which on an average show 105·6 M. per 100 F.

for legitimate and 104·2 for illegitimate births, that is 1·4 in favour of F. in illegitimate births. In this return the records for five countries, England, Scotland, Norway, Denmark, and Finland (all northern countries be it noted), show a slight reduction of F. among illegitimate births, the average for which is 105·28, while among legitimate births in these countries the average is 104·94 M. per 100 F., that is a decrease of 0·34 F.; in all the other countries there is an increased production of F. in this class.

The increase of F. shown on the whole in these latter statistics is indeed small, and it will probably be slightly decreased when still-births are included, but it must be recollected that living children will not be included in the figures for still-births in these countries, and any variation in the above results which may be caused by their inclusion will be very slight.

Finally, I would point out that it may be assumed with confidence that the largest proportion of illegitimate children are firstborn, and as it would appear to be a rule that there is a marked excess of M. among legitimate firstborn (ORCHANSKY, 1903; PUNNETT, 1903), this increase in the proportion of F. among illegitimate children is still more emphasised and still more remarkable.

It is worth while to examine my figures somewhat more in detail. An analysis of my Tables (1 to 36) of the annual returns for each district shows for whites the proportion of M. per 100 F., legitimate births, ranges from 102·43 to 115·33, while for illegitimate births the range is much greater, from 90·72 to 116·84.

Among coloured people, however, the opposite result is attained: for legitimate births the range is greatest, namely, from 87·11 to 128·15, while for illegitimate births it is from 87·59 to 113·04 (practically the same range as for whites).

Thus the proportion of the sexes born is more stable in the legitimate births for whites and in the illegitimate births for coloured people.

There is then a marked variation in the proportion of the sexes born by the two races, both from legitimate and illegitimate unions, and there is obviously a general tendency for the coloured people to bear a smaller proportion of M. than is the case for whites. Such general tendency may, I think, justly be designated as a racial characteristic under the conditions of life experienced in Cuba and, as I will show below, these conditions exert a very powerful influence. When I come to consider the monthly returns I will revert to this point, which is especially interesting in connection with the evidence for the recurrence of special breeding seasons for the two races in Cuba and in relation to the proportion of the sexes born by conceptions achieved at those times.

There is another point I would draw attention to, namely, that for whites the difference between the proportion of M. in legitimate as compared with illegitimate births is *least* when the proportion in legitimate births is highest (1906, difference 2·32), while among coloured people the reverse is the case, and the *greatest* difference between the two occurs when the proportion of M. in legitimate births is highest (1906, difference 13·51, see Table V).

This variation in the difference between the proportion of M. in legitimate and illegitimate children amongst whites and coloured peoples is consistent for these three years and is of considerable interest (see Table V). It would appear that the forces which induce this difference are differently distributed in the two races. This point also I will refer to again in connection with the breeding seasons.

Table V.—Difference between Legitimate and Illegitimate Births for Whites and Coloured Peoples in Cuba, 1904–5–6.

Race.	Year.	M. per 100 F. legitimate.	M. per 100 F. illegitimate.	Difference (illegitimate).
Whites	1904	107·53	104·34	– 3·19
	1905	106·42	102·46	– 3·96
	1906	109·53	107·21	– 2·32
Totals . .	—	107·78	104·4	– 3·38
Coloured . . .	1904	104·58	97·86	– 6·72
	1905	106·33	96·77	– 10·56
	1906	109·07	95·56	– 13·51
Totals . .	—	106·76	96·76	– 10·0

Still-births.

In both whites and coloured people there is a very considerably higher proportion of M. among stillborn children than is recorded under births; in other words, M. are shown to be more difficult to bear than F.; and, as might be expected, the annual returns for stillborn show considerably greater variation than do those for births.

For whites the total average for three years (Table XIV) is 158·87 M. per 100 F., or 51·73 higher than the total average for births. The average for three years for legitimate stillborn children works out at 161·4, that is 53·62 higher than for legitimate births, while for illegitimate stillborn the average is 151·46, that is 47·06 higher than for illegitimate births.

Thus here again the average excess of M. is greater among legitimate than among illegitimate embryos, and this is true for each year with one exception (1905).

The illegitimate stillborn amount on an average to 24·78 per cent. of the total still-births, which is 6·06 per cent. higher than the average recorded for illegitimate births, so that still-births or the death of infants under 24 hours old (I have no means of knowing which) are more prevalent in consequence of illegitimate than of legitimate unions.

The difference between the two averages for legitimate and illegitimate stillborn children is 9·94—almost exactly three times the difference between the averages for legitimate and illegitimate births—in other words, these figures confirm the view arrived at above, that the white women who submit to illegitimate union are more apt to produce F. ova than the married women; and this occurs in spite of the fact that a larger proportion of the former are probably *primiparæ.*

For coloured people the same general statements are applicable, but there is an obvious difference in degree, the excess of M. is nothing like so high as in whites.

The total average for stillborn children is 121·6 M. per 100 F., that is 21·53 higher than for births. The average for legitimate still-births is 134·31, 27·55 higher than for legitimate births, while for illegitimate still-births the average is 117·68, that is 20·92 higher than for illegitimate births. The difference between these two averages is 16·63, somewhat more than half as much again as the averages for legitimate and illegitimate births show.

This result, when compared with the same for whites, clearly indicates that white women have greater difficulty in bearing M. than coloured women experience, probably owing to racial differences in maternal pelvic structure or health; at the same time they both evidently find M. more difficult to bear and to present to the world in a vigorous condition than is the case with F. embryos. Again the average excess of M. is greater among legitimate than among illegitimate embryos (coloured), and this is shown for each year; but as the illegitimate still-births amount, on an average, to 75·08 per cent. of the total still-births, the proportion of M. in that total is lower than it otherwise would be.

The variation shown in the proportion of M. for legitimate and illegitimate still-births in the yearly reports for each district (in my Tables 1 to 36) indicates for both races very much greater variation than is evident for births, but this variation is more evident amongst coloured than it is amongst white peoples. No doubt the smaller number dealt with is responsible for some of this excessive variation, but when this factor is discounted there is still greater variation in still-births than in births.

For white legitimate stillborn embryos the proportion of M. varies from 35·9 to 200 in different districts per annum, while for illegitimate stillborn it varies from 80 to 250.

Amongst coloured people the proportion for legitimate stillborn varies from 27·27 to 550, for illegitimate from 60 to 203·57.

But these outside figures are very exceptional, and a clearer idea will be gained if I say that for whites there is only one instance out of the 18 returns for legitimate stillborn where the proportion of M. is lower than 113·79 or higher than 188·8, while for illegitimate stillborn there is only one lower than 108·3, while five are higher than 181·25. On the other hand, for coloured legitimate stillborn there are six returns lower than 117·65 and three higher than 176·92, while for illegitimate stillborn there are seven lower than 108·42, and only one higher than 151·43.

For whites, then, there is greater variation among illegitimate still-births, while for coloured the greatest variation is shown among legitimate still-births, a result which is precisely in accordance with the conditions shown under births for these two races.

As might be expected from the wide variation experienced, the ratio of the difference between M. per 100 F. in legitimate and illegitimate still-births is not regularly the same as was shown for births (Table XIV).

With the exception of 1905 for whites, there is each year a uniformly smaller proportion of M. in illegitimate still-births, and that proportion is, as a rule, more pronounced for coloured people than it is for whites, but that is all that can be said.

It is of exceeding interest to find that the greater excess of M. in legitimate compared with illegitimate births, in both whites and coloured peoples, occurs also in the records for still-births for both peoples. For some reason or other it is now clearly shown, that not only do illegitimate births show a diminution in the preponderance of M. but that illegitimate unions result more often in the *conception* of F. than do legitimate unions (see Table IV). This is an important generalisation which has not, so far as I know, been made before.

Those who maintain that the age of the parent is a powerful factor influencing the sex of the offspring may claim that these figures support their view. Their contention is that a larger proportion of F. is produced by younger than by older parents. Under certain extraneous conditions I am disposed to think there is some justification for this view, but apart from these conditions it does not appear to me such conclusion is justified by these records.

Amongst whites the illegitimate conceptions are but a small proportion of the whole; in the case of these people illegitimate unions are almost certainly mainly effected by young people, and yet these records show a difference of only 3·05 M. per 100 F. less than legitimate unions.

The figures for coloured people, on the other hand, show a majority of illegitimate conceptions, while the range of age of the parents is almost certainly much wider than it is among whites (*vide* Census 1899), and yet there is a much greater difference, viz., of 9·82 M. per 100 F. less than results from legitimate unions for these people (Table IV).

But a still more potent argument against the theory that the age alone of the parents affects the proportion of the sexes produced is to be found in the statistical evidence of the tendency of *primiparæ* to produce an excess of M., and this I have already referred to in connection with my figures.

It is necessary to draw attention to the fact that there is, very usually, one important difference between the begetting of illegitimate and legitimate children. In the case of the former the time for sexual intercourse is determined by the woman, by the intensity of her sexual vigour, while for the latter this is not so.

It seems to me, then, reasonable to suppose that a considerable proportion of women who submit to or who court illegitimate union are physiologically different from those whose powers of restraint are an efficient bar to such unions, the former being endowed with more exceptionally active reproductive systems. If this be true it would appear probable that the main factor influencing the increased production of F. in this class of union must be an exceptionally active metabolism, which favourably affects the development and ripening of ovarian ova which produce F. (compare HEAPE, 1907 A).

This suggestion is open to the objection that illegitimate unions do not produce a sufficiently large proportion of F. to make such a view probable, and it is an objection which may be urged against any proposal I have seen advanced to explain the facts. I would meet that objection by drawing attention to the fact that no doubt a large proportion of illegitimate unions are due to dominant *sexual* activity alone, that it is a common fallacy to suppose exceptional sexual activity is necessarily correlated with exceptional reproductive activity (metabolism), and that when the latter does not exist there would, on my hypothesis, be no special stimulus exerted in favour of the production of F.

It is not advisable to burden this communication with a detailed survey of the evidence I have collected in favour of the view that sexual and reproductive activity are not necessarily correlated, I would only add that such is my strong opinion.

If I am right in my main contention, the conclusion cannot be avoided, that the causes which induce variation in the proportion of the sexes conceived in consequence of legitimate union on the one hand and illegitimate union on the other, cannot in any way be explained by the laws of heredity but have direct relation to the conditions prevailing at the time of conception. This is an important generalisation not only as direct evidence of the exercise of extraneous forces on the proportion of the sexes produced but, in view of its relation to the forces which induce the ripening of ovarian ova of different sexes, it also bears on the means by which these forces act.

The inference to be drawn from this is that a specially active reproductive metabolism in women is associated with the production of ova which give rise to F., and I will adduce further evidence in favour of this view when I come to deal with breeding seasons (compare HEAPE, 1907 B).

It is interesting to compare the results given above with those set forth by RAMON DE LA SAGRA in his great work on Cuba (1838). In those days 56 per cent. of the people in the Island were coloured, a large proportion of which were slaves, and 44 per cent. were whites. The proportion of M. per 100 F. among whites was 118·43, among coloured 148·72; in total, 134·37 M. per 100 F.

The slaves appear to have been very badly treated; they were worked to the full extent of their capacities, or beyond it, and were, generally speaking, in a wretched condition; the whites, on the other hand, lived a luxurious life ('Encyclopædia,' 1877).

No doubt the records of births made in those days cannot be accepted as accurate, and probably there was greater inaccuracy for the coloured than for the white race;

nevertheless, the main trend of the totals given will indicate the general tendency, and they are worth quoting.

For the years 1825–29 (inclusive), De la Sagra gives a total of 8002 white and 8250 coloured births; total, 16,252. Of the whites, 32·12 per cent. were illegitimate; of the coloured, 66·29 per cent. came under that head.

For whites, legitimate births worked out at 104·75 M. per 100 F.; illegitimate births, 96·33; the average being 101·97.

For coloured legitimate births show 102·55; illegitimate, 106·3; and the average for both 105·02 M. per 100 F.

The total legitimate births show 104, the illegitimate 103, and the total 103·5 M. per 100 F.

According to these figures, then, in 1825–29 the whites produced a very considerably higher proportion of F. than the coloured people, a result which is reversed in the present day.

A comparison of this result with that already given by me bears upon the theory that the crossing of races is favourable to the production of F., and a word must be said on this head.

No doubt half-breeds will be classed amongst coloured in most instances in the present day, though probably some will be included amongst whites. That is to say, that illegitimate half-breeds will be classed as coloured, while those which are legitimate *may* be included amongst whites in some cases. How small a number is the latter can be judged from my figures of marriages (Table XIV), from which it will be seen that the average number of coloured women marrying white men, per annum, is 80; I think, then, this latter may be regarded as a negligible quantity.

In 1829, however, hybrid offspring of white men will certainly be classed as coloured in practically every case; pride of race would ensure that in the days of slavery.

The possibility, then, that the increased proportion of F. among the illegitimate coloured births in my returns may be to some extent due to crossing, is emphatically negatived by the increased proportion of M. in that class given in De la Sagra's figures.

It must be admitted there is some evidence in favour of the view that unions of half-breeds are less fertile than pure-bred unions, and that the former are disposed to produce sterile F. offspring in some cases (Broca, 1864).

The Cuba Census, 1899, does not give statistics of the size of natural families, and at the time the Census was taken the country had not recovered from the effects of the war, effects which, as is there pointed out, tend greatly to reduce the number of infants under five years of age. It is, however, there remarked that in the province of Santiago (Oriente in my tables) there is evidence of a high birth-rate under ordinary conditions; and this is of interest, because it is precisely that province in which the largest proportion of mixed coloured peoples and the greatest proportion of "consentual unions" are recorded. Moreover, my table (47) shows that the average proportion of M. per 100 F. (total production) in that province, for the years 1904–6, is 100·66, which is 0·46 lower than the average for the whole coloured race for three years (Table XIV).

A comparison of the figures in Table III and Table XIV shows that, whereas the average births of white children per annum is in proportion of 1 child for 23·56 adults, the average births of coloured children is in proportion of 1 child to 19·23 adults.

Thus there does not appear to be any sufficient evidence in these returns to show either that illegitimate coloured offspring are largely half-breeds or that the coloured people are less fertile than the whites, and it may be concluded that the increased production of F. by the coloured people of Cuba is not due to crossing.

Total Production.

The effect of the inclusion of still-births in the returns for whites in Cuba, for the three years, is to increase the proportion of M. per 100 F. by 1·28 ; and this increased proportion is very regularly maintained for each of these years, viz. : 1904, 1·28 ; 1905, 1·17 ; 1906, 1·38.

The returns for coloured people are very similar in this respect, but on the whole the increase of M. is slightly less : 1904, 1·1 ; 1905, 1·22 ; 1906, 0·77 ; and for the total for the three years, 1·05 (Table XIV).

When it is recollected that the total population of whites shows a considerable excess of M. while an excess of M. children is born by whites (107·14), and the total population of coloured shows a considerable excess of F. while there is practically no excess of M. born by coloured people in Cuba (100·07), it is conclusively shown that these figures do not substantiate the view held by some observers that the sex produced in excess is always the sex which is in a minority in the adults. Where such a condition is found it is obvious that forces are exercising influence which are absent or overwhelmed by other, stronger forces in Cuba.

Marriage.

Amongst whites, 81·28 per cent. of the children born are legitimate, and records of marriages are therefore of some importance ; but for coloured people, only 34·22 per cent. of whose children are legitimate, one cannot expect marriage records to have any special bearing.

In my Tables 37–42, in which figures are given for each month of the three years 1904–5–6, for Cuba as a whole, I find there are special periods when the least and the greatest number of marriages take place. Thus August, 1904 (1127), July, 1905 (1310), July, 1906 (1071), are the months when most marriages are made for whites, while February in each of these years has the fewest marriages to its credit, viz., 1904 (440), 1905 (725), 1906 (706). These are the actual months in which the highest and lowest figures occur. Treated in a more general way, the months during which over 1000 marriages were made are July, August, and

September, 1904; each month from May to October, 1905; and July only in 1906; while January to April are the months during which the fewest marriages are made.

Marriages, then, take place chiefly during the hot weather.

The figures for coloured marriages are too small to admit of analysis: they vary only from 102, which is the smallest number for any one month, to 274, which is the highest number recorded. Speaking generally, however, the greatest number of coloured marriages occur from July to September in 1904 and 1906, and from May to July in 1905, while the fewest occur in the early spring months.

There is thus a general agreement between whites and coloured peoples as regards marriage seasons, and it is remarkable that the extension in 1905 of what may be taken as the usual marriage season (July to August) is common to both peoples. In 1905 there was an exceptionally large number both of marriages and of children born.

Since it will be necessary to refer to these data later on, I have included them in Table VI.

Birth-rate and Breeding Season.

Concerning the times of highest and lowest birth-rate, there is a similar remarkable agreement between whites and coloured peoples (Table VI). Taking first total births, the highest figures for whites occur in July, 1904, July, 1906, while for 1905 there are two specially high periods, July and November–December. The lowest figures occur in January, 1904, February, 1905, while in 1906 there are two such periods, February and September.

For coloured the highest figures occur in July, 1904, July, 1906, while for 1905 there are two periods, July–August and November–December. The lowest figures for these people occur in January, 1904 and 1905, and in 1906 during two distinct periods, February and September.

This result very clearly shows the recurrence year by year of a special breeding season; both whites and coloured exhibit a specially high birth-rate in July. There is also indication, in the 1905 returns, of a second breeding season for both races shown by the marked rise in the birth-rate in November–December for that year. A similar tendency is also shown for the other years during these months, but to a much less extent.

On the other hand, a specially low birth-rate for both races occurs in January and February of each of these years, while in 1906 they both show a second even lower birth-rate in September.

It occurred to me that the records for illegitimate births might be expected to show with even greater emphasis the occurrence and the dates of these special breeding seasons. It will be seen I was wrong in that expectation, but the figures undoubtedly demonstrate with equal force the existence of a breeding season, and I have added them to Table VI. Briefly, they show July has a uniformly high and February a uniformly low birth-rate, while in 1905 there is a second rise in November and December, and in 1906 a second marked fall in September or October for both races.

Table VI.—Dates and Numbers (Highest and Lowest) of Marriages, Total Births, and Illegitimate Births, for Whites and Coloured Peoples in Cuba, 1904–5–6.

	Race.	Highest or lowest.	1904.	1905.	1906.
Marriages	Whites, M. .	Highest	Aug., 1127	July, 1310	July, 1071
		Lowest	Feb., 440	Feb., 725	Feb., 706
	Coloured, M. .	Highest	Sept., 239	June, 274	Aug., 247
		Lowest	Feb., 102	Jan., 213	Oct., 138
Total births	Whites . . .	Highest	July, 4845	July, 4683 Nov. 5000 Dec., 5905	July, 4748
		Lowest	Jan., 2233	Feb., 3203	Feb., 3168 Sept., 2835
	Coloured . .	Highest	July, 1463	July, 1435 Aug., 1616 Nov., 1452 Dec., 1625	July, 1248
		Lowest	Jan., 706	Jan., 1067	Feb., 993 Sept., 784
Illegitimate births . .	Whites . . .	Highest	July, 1038	July, 888 Nov., 1103 Dec., 1343	July, 763
		Lowest	Feb., 529	Feb., 617	Feb., 553 Oct., 460
	Coloured . .	Highest	July, 1044	July, 968 Aug., 1049 Nov., 960 Dec., 1109	July, 754
		Lowest	Feb., 511	Feb., 695	Feb., 613 Sept., 478

It will be noticed that for total births and illegitimate births, for both races, in 1904, the lowest birth-rates are, with one exception, always less than half the highest birth-rates, and the exception is only 10 more than half (illegitimate white births for 1904); that in 1905 there is still a strongly marked difference, the lowest being in two cases slightly more and in two cases slightly less than three-fifths of the highest birth-rates of that year; while in 1906 the difference is very similar, being slightly less than three-fifths in one case, slightly more in two cases, and equal to three-fifths in the fourth case.

This result is surely very striking; it is impossible to avoid the conclusion that the inhabitants of Cuba are subject to influences which have a specially stimulating effect upon the reproductive system at certain times of the year. There can be no doubt this is so.

The close agreement of the returns for total births and for illegitimate births for both races of people shows that the returns for legitimate births alone must be the same also.

So far as marriage is concerned, it is clear that these times when children are born in exceptional numbers have no relation whatever to the periods when most marriages are made, and that we must look for other causes to explain the matter.

The period of the highest birth-rate is most regularly marked in July, and the primary breeding season therefore occurs about November–December. After July, as a rule, the number of births falls off until November, when there is again a rise sufficiently marked in each year to indicate that a second breeding season normally exists in March, though as a rule it is much less marked than that of November. Both these breeding periods are entirely without relation to the chief marriage months.

In 1905, however, the second breeding season is specially emphasised; not only is there a substantial advance on the increased birth-rate normally seen in November–December, but there is an excess over that recorded for July; thus the normal spring breeding season was unusually boisterous that year. The exceptional fertility which has already been noted for that year is no doubt due to the causes which induced this specially vehement reproductive activity in March and April of the same year.

My belief that this is exceptional is strengthened by the following facts. The total births for the following year (1906) are considerably lower than for 1905, though higher than for 1904, and yet the highest number of births during the period when most children are born is markedly lower in 1906 than it is in 1904, especially among illegitimate births. In the same way the lowest birth-rate in 1906, though it is normally low in February, is abnormally low again in September. Thus it is obvious the breeding season which gives rise to the second high birth-rate period in 1905 has disturbed the normal breeding conditions in 1906.

Regarding the causes which conduce to exceptional reproductive activity at these special times: I have drawn up tables of barometric pressure (corrected), temperature (centigrade), and percentage of relative humidity for each month of these three years, taking the daily mean records and averaging them for each month. Broadly, the results show a maximum temperature from May to October, then a marked fall for November, averaging 1°·84 C., while the barometer shows a rise of 5·92 on the average, and relative humidity a fall of 1·59.

The sudden change in the climatic conditions in November here indicated is undoubtedly conducive to a similarly abrupt increase of metabolic activity, and a certain stimulus is doubtless thus accorded the reproductive system of the inhabitants. I would not assert that we have here a cause which is alone sufficient to account for the advent of the normal winter breeding season, but I cannot doubt that a rapid increase of vital activity following a prolonged period of enervation must profoundly affect both the degree of appetite and the power of assimilation of every healthy individual, and must thus substantially help to promote breeding activity.

The spring breeding season is associated with similar marked climatic changes, though not to the same extent. The average temperature in these three years is lowest in January, and from that month to March there is an average rise of 1°·77 C. The barometer, which regularly rises from September to December, falls between January and June, and shows an average fall from January to March of 1·53, while the percentage of relative humidity shows a fall of 1·24 between these dates.

The spring breeding season, then, is correlated with the first annual rise of temperature (it is still far from the maximum, which averages 3°·88 C. higher than it is in March), with a slight fall in the barometric pressure, but with a diminution in the percentage of humidity.

If these climatic changes therefore have effect on human reproductive activity, they must act quite otherwise than do those which are correlated with the winter breeding season.

Now it is to be noted that the increased reproductive activity which marks a breeding season comes in the form of a burst; this is clearly shown by the sudden rise in the birth-rate nine months afterwards, the rise is not a gradual process. The fall in the birth-rate which follows is not equally sudden though it is equally deep when completed. Thus it may be concluded the stimulus which effects the result is suddenly applied, but takes longer to act on some individuals than on others, either on account of personal peculiarities or, more probably, because of a difference in their mode of life or in the district they inhabit. Again, the low birth-rate during the autumn shows that the continuity of the cool weather spell is not favourable to conception, while the first marked increase of sunlight and warmth in the spring is clearly associated with a renewal of reproductive activity, demonstrated by the sudden increase of the birth-rate in November–December.

Thus there is substantial reason for the view that marked stimulation of the reproductive system of individuals as a whole in Cuba is closely associated with climatic changes year by year, and there can, I think, be no doubt that climate has a pronounced effect on reproductive activity; but such effect is not due to the results brought about either by a fall or by a rise of temperature only, it is essentially governed by the resultant of the various forces which are induced by a marked *change* of climate within certain limits.

Climate, however, is not the only factor which influences the breeding seasons, that there must be other causes is clear from the fact that there are no special climatic conditions which would appear to be sufficient to account for the unusually vigorous spring breeding season in 1905 (*vide* birth-rate for November–December, 1905).

It would require an intimate knowledge of the normal conditions of the country and of the inhabitants, to compare with the conditions prevailing in 1905, in order that one should be enabled to advance with any degree of plausibility a satisfactory reason for this particular period of virility; such knowledge I have not got, but I suggest with some confidence it is to be found by a study of the comparative quantity or quality of the food then available.

In previous papers I have given strong reasons in support of the view that all mammalian breeding seasons are correlated with climatic changes and with the quality or quantity of food available. "Speaking generally, the rhythm of the sexual season and the power of breeding is seasonal; it is governed by external forces which are exerted in consequence of seasonal change, and by internal forces which are dependent upon individual powers; further, there is abundant evidence that nutriment and the capacity for storing nutriment and the energy resulting therefrom are essential factors" (HEAPE, 1900).

I have seen no evidence which leads me to depart from the conclusions so expressed for mammals generally, and I would confidently maintain that where man exhibits a breeding season the same remarks are applicable to him. The climatic conditions prevailing in Cuba and the social condition of the inhabitants are perhaps peculiarly favourable for the purpose of testing this view for man, and I think there can be no doubt the evidence I have brought forward is strongly confirmatory of that view.

The Proportion of the Sexes produced at Times of Highest and Lowest Birth-rate as compared with the Average Proportion for the whole Year.

There is, however, another interest attached to the special breeding seasons and to those seasons where fewest conceptions occur; they have bearing on the problem of sex production, and show that there are forces other than heredity which influence the proportion of the sexes produced.

If there is any truth in my contention that the quantity or quality of nutriment assimilated by the mother affects the proportion of the sexes produced among those animals in which only a limited number of ovarian ova mature during each breeding season, and if I am right in my conclusions regarding the effect of climate and food on breeding seasons, then it must surely be expected that the proportion of the sexes born by women at the time of highest fertility will be different from the proportion born at the time of lowest fertility. According to the returns here dealt with this is the case.

In Table VII. I have given the proportions of M. per 100 F. during the months of highest and lowest fertility, and for the whole year, for each of the years 1904–6, and have added the average results for the three years, for both whites and coloured peoples.

For whites the average shows a marked increase in the proportion of F. born during the months of highest fertility and a slight increase of M. during the months of lowest fertility, as compared with the average for the whole of the three years. For coloured, on the other hand, while there is an increase of F. born at times of highest fertility it is a very slight increase, whereas the increase of M. born during the month of lowest fertility is very marked.

Table VII.—Proportion of the Sexes produced at times of Highest and Lowest Fertility compared with the Average for the whole Year. Cuba, 1904–5–6.

Race.	Year.	Month of highest fertility.	M. per 100 F.	Month of lowest fertility.	M. per 100 F.	M. per 100 F. for the whole year.
Whites	1904	July	105·47	January . .	106·19	106·88
	1905	July	103·93	February . .	106·65	105·63
		November . .	102·92			
		December . .	104·18			
	1906	July	105·0	February . .	113·05	109·14
				September . .	106·33	
Average .	1904–6	—	104·29	—	108·21	107·14
Coloured peoples	1904	July	93·26	January . .	108·87	99·9
	1905	July	104·12	January . .	99·81	99·92
		August . . .	98·77			
		November . .	100·83			
		December . .	98·17			
	1906	July	101·61	February . .	116·34	100·43
				September . .	110·19	
Average .	1904–6	—	99·3	—	108·3̇	100·07

In detail it will be observed that for whites the increase in the proportion of F., as compared with the yearly record, is invariably shown for each month of highest fertility, while the increase of M. during the months of lowest fertility is not demonstrated in every case. For coloured, on the other hand, there is much greater irregularity in the records for highest fertility, while the excess of M. at times of lowest fertility is, with one exception, markedly higher in each case.

Thus whites show a marked sensibility to the influences which induce the production of F., while the coloured peoples are much more influenced by the forces which stimulate the production of M.

Now I would again point out that, in accordance with the results arrived at by others (for instance, Cleisz, 1895; Düsing, 1883, 1884), as a high proportion of F. births is sure indication of a nation's capacity to thrive, whereas an excess of M. births is a sign of a more severe struggle for existence, it may be concluded that the conditions of life in Cuba are more favourable for coloured than for white people, and this result is precisely what one would expect when considered in relation to the origin of these people and their respective capacities for adaptation to the climatic conditions which prevail in Cuba (WOODRUFFE, 1905).

As whites are normally existing in Cuba under difficulties, any change favourable to their racial peculiarities will have a marked result, and this is shown by the increase of F. born from conceptions achieved during November and February, when their reproductive systems are specially stimulated by climatic changes, and when their assimilative power (and probably the supply of more nutritious food) is increased. On the other hand, unfavourable conditions would not produce so marked an effect on the already high M. average, hence the few conceptions taking place in June result in only a slight increase of M. births in January and February.

For the coloured peoples the same reasoning applies; they are living in an environment which suits them, the average proportion of females produced per annum is very high; therefore, while the conditions prevailing in November cannot fail to stimulate their breeding power, the result does not show a further marked increase of F. births in July. But unfavourable conditions have more scope for action; a race whose reproductive power is effecting a maximum average result will be all the more sensitive to adverse conditions and this is shown in the marked increase of M. in January and February, the result of conceptions achieved during the trying summer months.

From a physical point of view, I take it, the greatest scope for any change in the proportion of the sexes produced will be in the direction of least resistance. Hence when a race is producing, say, an abnormally high proportion of M., it is pushed hard up against the M. pole, and any relaxation of the pressure which causes that result will induce more marked effect than can be gained by increasing the pressure; that is to say, it will be more receptive of opportunities to increase the F. output than it will be to pressure calculated to increase the already excessive M. output.

Thus in Table VII it is demonstrated that when the birth-rate is highest the proportion of F. produced is highest, and when the birth-rate is lowest the proportion of M. is highest, but it is also shown that, while whites are more receptive of conditions which favour the increased production of F., coloured people react far more to conditions favouring the increase of M.; hence the production of M. is most stable amongst whites, and of F. amongst coloured peoples in Cuba; and this is the hereditary tendency of these races.

It is worthy of note that the excessive proportion of M. born in February, 1906, for both whites and coloured, coincides with an abnormally high temperature in June, 1905, the date of conception.

I would also point out that when the high birth-rate persists for two consecutive months the results are different for the two races; that while for whites (November–December, 1905) the maximum of F. produced occurs in the first of these months, for coloured peoples (July–August and November–December, 1905) the impulse is strongest in each case during the second month.

Reference to Table VI will also show that the maximum number of births invariably occurs in the second of two consecutive months for both races; thus the stimulus which favours the production of F. has immediate effect on whites in its greatest degree, whereas for coloured people its greatest effect is only attained after prolonged experience, that is to say, its effect is cumulative in the latter case, a result which is in accord with the arguments advanced above.

Finally it will be observed for the more sensitive white race that the abnormally high production effected in 1905 (Table XIV), which is correlated with a low average proportion of M. for that year, is followed by a specially high average of M. in 1906; a condition which is but feebly indicated in the records for the coloured race.

The proportions of M. in February and September, 1906, are concerned with numbers far too small to have any marked effect on the totals for the year; the latter truly represent the general tendency of the whole year's breeding operations.

The Proportion of the Sexes produced by Legitimate and Illegitimate Unions at Times of Highest and Lowest Fertility, as compared with the Average Proportion.

In Table V it was shown that there is a consistent difference between the proportion of M. born from legitimate as compared with illegitimate unions, in both white and coloured races, for each of the three years under review; and the inference was drawn (p. 290) that the forces which induce that difference act differently on the two races.

In the last section this inference was shown to be justified for births as a whole, and when the figures for legitimate and illegitimate births for the periods of highest and lowest birth-rates are separately examined the same fact is again demonstrated.

I have presented these results in Table VIII. It is there seen that the proportion of M. is higher during the months of lowest fertility than during the breeding seasons in both legitimate and illegitimate births; this is true for both races, but the difference is greater for coloured than it is for whites.

It is also shown that the proportion of F. is always higher for illegitimate than it is for legitimate births during both these seasons for both races; but whereas the difference is greatest during the months of highest birth-rate for whites it is greatest during the months of lowest birth-rate for coloured people.

This variation is capable of the same interpretation already advanced regarding the stability of the sex ratio of the two races (pp. 301–2), and, indeed, substantially adds to the probability of its truth.

It will be noticed, however, that while the average proportion of M. for legitimate births for the whole of the years 1904–6 is intermediate between the average proportions of legitimate M. during the periods of highest and lowest birth-rates in the case of both races, yet the average proportion of M. among illegitimate births for the years 1904–6 is higher than the average for the months of lowest birth-rate for whites and lower than the average for the months of highest birth-rate for coloured peoples.

Table VIII.—Showing M. per 100 F. for Whites and Coloured, Legitimate and Illegitimate Births, for Periods of Highest and Lowest Fertility compared with whole Year, for Years 1904–5–6, in Cuba.

Race.	M. per 100 F. of total births recorded for months of highest birth-rate. 1904–6.		M. per 100 F. of total births recorded for months of lowest birth-rate. 1904–6.		M. per 100 F. of total births recorded for whole of years 1904–6.	
	Legitimate.	Illegitimate.	Legitimate.	Illegitimate.	Legitimate.	Illegitimate.
White . . .	105·74	98·8	109·34	103·3	107·78	104·4
Coloured . .	103·23	97·38	119·27	102·75	106·76	96·76
Total . .	105·41	98·08	110·48	103·01	107·67	100·4

That is to say, although whites *do* produce the highest proportion of M. among legitimate births during the periods of lowest birth-rate, they *do not* produce the highest proportion of M. among illegitimate births at that time; and although coloured people *do* produce the highest proportion of F. among legitimate births during the period of the highest birth-rate, they *do not* produce the highest proportion of F. among illegitimate births at that time.

Thus, as regards illegitimate births the period when whites produce the highest proportion of M. is not represented by the period of lowest birth-rate, and the time when coloured people produce the highest proportion of F. is not represented by the period of highest birth-rate; but this is true *only* for illegitimate births.

Now my monthly tables (37–42) show that whites produce the highest proportion of M. among illegitimate births in the spring, usually just *after* the months of lowest birth-rate, and again in the autumn to a less degree; similarly, coloured people produce the highest proportion of F. among illegitimate births, usually in the summer just *after* the months of highest birth-rate, and again in the spring to a less degree.

It is for this reason that the figures given in Table VIII for the proportion of illegitimate M. among whites at the time of lowest birth-rate are not the highest obtainable for this class, and the figures for illegitimate F. among coloured during the months of highest birth-rate are not actually the highest obtainable for this class.

It will be recollected it has been claimed that the results obtained from records of illegitimate births should be more strictly in accordance with natural forces than is the case when marriage is concerned in the calculation. The interest attaching to the foregoing facts is due to the strong evidence it brings forward to show that the forces which act on whites in favour of the production of M. is cumulative, while those forces which favour the production of F. are short-lived; whereas for coloured peoples the reverse is the case: the inducements given to produce M. are short-lived, while those exerted in favour of F. are cumulative.

Thus we have additional proof that the tendency of whites in Cuba to produce a large proportion of M. and of coloured to produce a high proportion of F. is due to the action of natural forces which have a different effect on the two races.

This difference of effect is no doubt due to hereditary qualifications, but the result is equally surely brought about by extraneous physical conditions.

Deaths and their Influence on the Sex Problem.

The returns for deaths show a marked variation for the two races, a variation which is very regular for each of the three years (Table XIV).

The proportion of M. per 100 F. who die, for whites is 129·76, for coloured 92·2; this is the total result. The annual returns for whites show an extreme variation of not more than 0·14, while for coloured it is as high as 5·33; but in no case is the proportion less than 129·69 for whites or more than 95·68 for coloured peoples.

This result is no doubt influenced by the total proportion of the sexes of each race living in the Island, details of which I have not been able to obtain for the period under consideration, though there can be little doubt M. are still in excess amongst whites and F. among coloured people.

In Table IX I have summarised the M. and F. births (not including still-births) and deaths for both races, and have shown the excess of births over deaths, and the percentages for each of these items for each of the three years, and for the total.

The total results (Table XIV) show that whites claim 77 per cent. of the births and suffer 65 per cent. of the deaths; coloured claim 23 per cent. of the births and suffer 35 per cent. of the deaths; from which it would appear that the whites are increasing proportionately more than the coloured peoples. In conformity with this result, Table IX shows that whites claim by far the greatest share of excess of births over deaths.

Roughly, there are two-thirds white and one-third coloured inhabitants in the Island (Table I), and yet the excess of births over deaths for whites amounts to 87·19 per cent. of the total excess of births, against 12·81 per cent. for coloured people during these three years. It is remarkable that of this excess there are more F. than M. among whites (94·6 M. per 100 F.), and more M. than F. among coloured people (121·7 M. per 100 F.), and in consequence of that, although a considerable excess of M. are born by whites each year, the excess of M. deaths causes the net

Table IX.—Proportion of Births and Deaths for Whites and Coloured Peoples in Cuba. Years 1904–5–6.

Year.	Births or deaths.	Whites.					Coloured.					Total.			
		M.	F.	T.	Percentage of total with total for year.	M. per 100 F.	M.	F.	T.	Percentage of total with total for year.	M. per 100 F.	M.	F.	T.	M. per 100 F.
1904	Births	20,357	19,047	39,404	76·75	106·88	5,967	5,973	11,940	23·25	99·9	26,324	25,020	51,344	
	Deaths	8,479	6,538	15,017	65·2	129·69	3,804	4,210	8,014	34·8	90·35	12,283	10,748	23,031	
	Excess births	11,878	12,509	24,387	86·13	94·95	2,163	1,763	3,926	13·87	122·63	14,041	14,272	28,313	98·38
1905	Births	25,362	24,009	49,371	76·2	105·63	7,706	7,712	15,418	23·8	99·92	33,068	31,721	64,789	
	Deaths	9,975	7,688	17,663	65·2	129·75	4,609	4,817	9,426	34·8	95·68	14,584	12,505	27,089	
	Excess births	15,387	16,321	31,708	84·1	94·28	3,097	2,895	5,992	15·9	106·98	18,484	19,216	37,700	96·19
1906	Births	22,412	20,534	42,946	77·85	109·14	6,122	6,096	12,218	22·15	100·43	28,534	26,630	55,164	
	Deaths	10,963	8,444	19,407	65·02	129·83	4,960	5,477	10,437	34·98	90·56	15,923	13,921	29,844	
	Excess births	11,449	12,090	23,539	92·97	94·7	1,162	619	1,781	7·03	187·72	12,611	12,709	25,320	99·23
Total 1904–6	Excess births	38,714	40,920	79,634	87·19	94·6	6,422	5,277	11,699	12·81	121·7	45,136	46,197	91,333	97·7

increase to be in favour of F.; amongst coloured people, on the other hand, there is a net increase of M. although the sexes are born in almost equal number.

To revert again to Table IX, and the excess of births over deaths. The figures for whites are very uniform so far as proportion goes, they vary from 94·28 to 94·95 M. per 100 F., the average being 94·6; for coloured there is much greater irregularity, the variation being from 106·98 to 187·72 M. per 100 F., the average being 121·7; but they are consistent inasmuch as the net increase in the case of whites is always an excess of F. over M., while for coloured it is always an excess of M. over F.

In spite of the fact that for each year 1904–6 the actual number of deaths shows a regular increase for both races, there is a marked excess of births over deaths, for both, in each of these years. But in this respect the return is not uniform. In 1905 the excess of births over deaths is highest, in 1906 it is lowest, while in 1904 it is only slightly higher than in 1906.

Thus 1905 is again shown to have been a specially prolific year, and in that year it is also shown that for both white and coloured peoples the excess of births over deaths shows the smallest proportion of M., that is to say, in spite of the death-rate greater fertility is associated with a larger proportion of F.

It has recently been pointed out ('Times,' 1908) that in England and Germany, in spite of the excess of M. children born, the excess of adult F. has been steadily rising in recent years in consequence of the greater mortality among M. children, and the question is asked, is this a law of civilisation or a consequence of increased prosperity?

The issue is here confused by the failure to consider births and deaths separately. There can be no doubt that an abundance of adult fertile F. is favourable to the increase of a species, but it can hardly be justifiably held that a high mortality of M. children is a sign of prosperity.

In accordance with the views already expressed, the *birth* of a high proportion of F. is sure indication of maternal procreative vigour, but the *survival* of an excess of F. at the expense of an excess of M. deaths certainly cannot be so expressed. As I have already shown, it would appear that an excess of F. births may be brought about by favourable breeding conditions, and although such a result may be quite irrespective of the "advantages of civilisation," it might truly be ascribed to "a consequence of increased prosperity." On the other hand, an excess of M. deaths among M. children cannot be similarly accounted for. There is no doubt M. children are more difficult to bear and to rear than F. children, and to this cause the excess of M. deaths among children is due. If, then, the increase of adult F. is due to an increased death-rate among M. children then the latter may be ascribed to the deleterious effect of civilisation on the capacity of the mother to withstand the extra strain their production demands, or on the environment during early childhood; but if the M. death-rate is not, while the F. birth-rate is increased, then the result must be ascribed to prosperity, whether that be a result of civilisation or not.

The figures available for Cuba emphasise this point. Among whites the net increase shows an excess of F., but it would be wrong to describe this result as a consequence of increased prosperity, for it is due solely to an excessive M. death-rate and the apparently favourable condition of this race in Cuba is fictitious. Among coloured people, however, a much higher proportion of F. are produced; potentially in this respect they have advantage over the whites, but an excessive F. death-rate at the present time annuls that advantage, and from the point of view of increase they take the second place. How low this second place is a further examination of the figures will show. Thus, whereas the death-rate of coloured people is about equal to that of the whites, namely, one-third, their birth-rate is less than one-fourth, and the excess of births over deaths little more than one-eighth. The potential advantage, then, is limited to those who breed and has no relation to the relative fertility of the races.

It has already been stated (p. 282) that coloured people in Cuba have been decreasing in proportion to whites for the last half century.

The figures given above show that white immigration is not alone responsible for this, since the actual rate of increase of coloured people is less than that of whites.

The Census (1899) does not show the size of blood families ("kindred families"). I have, therefore, no means of judging of the relative fertility of individual breeders; details of the number of persons per household ("economic families") are, however, given, and it is stated that in this respect the size of families among white and coloured was about the same.

We have, however, clear evidence of one vital cause for the relatively low rate of fertility of the coloured race, and that is the high death-rate of F. and the gradual tendency to excess of adult M.

If the birth of a high proportion of F. is a sign of vigour in a race, as I maintain, the coloured people should be more prolific than the whites in Cuba, but they are not so because of the high F. death-rate. The question arises then, what is the cause of this high death-rate; is it due to inherent physiological weakness? in which case the mere production of a high proportion of F. is no evidence of virility in a race; or is it due to greater risks run by these F. in their work or by their habits? in which case the result is due to extraneous causes.

In the Annual Report of the Chief Sanitary Officer for Cuba, for 1905, it is shown that the greatest racial variation in the percentage of deaths occurs from 1 to 5 years of age, when whites are most prone to die and coloured freest from danger of death, whereas the lowest percentage for whites and the highest for coloured is after the age of 5 years (Table X).

This result shows that coloured people do not specially suffer during early childhood, and a survey of the detailed account of deaths from special diseases given in this Annual Report shows that the six diseases which are chiefly responsible for the death of coloured infants and children up to 5 years of age claim more M. than F.

Table X.—Deaths in Relation to Age and Race in Cuba, 1905.

Age, years.	Total percentage of deaths.	Proportion of deaths, whites. Per cent.	Proportion of deaths, coloured. Per cent.
0 to 1	29·52	66·49	33·51
1 „ 5	12·6	68·58	31·41
5 „ -	57·88	63·37	36·63

The diseases are malaria, meningitis, tetanus, bronchitis and pneumonia, etc., enteritis, and congenital debility ; in all of which, with the exception of meningitis, there is an excess of M. deaths, the totals showing M. 1566, F. 1341. Enteritis is the most deadly (M. 589, F. 523), meningitis the least (M. 108, F. 119).

This result shows conclusively that the excess of F. deaths among coloured people is not due to excessive weakness of coloured F. children up to 5 years of age.

In the introduction to the Report, attention is drawn to the fact that 36·19 per cent. of all deaths between the ages of 15 and 60 years was caused by pulmonary tuberculosis, and from the following details it will be seen (on the supposition that one-third of the population is coloured) that the coloured race suffers far more in proportion to population than the whites, and the coloured F. more than the M. from this disease.

For whites (above 5 years) there are M. 1101, F. 1061, total 2162 deaths from pulmonary tuberculosis ; for coloured, M. 531, F. 838, total 1369 deaths from that disease.

The excess of F. over M. deaths among *coloured* people from this disease alone during the year 1905 amounts to 307 ; when to these figures is added deaths from various forms of cancer, malignant tumours, and puerperal disease (M. 44, F. 282), which show an excess of F. deaths of 238, the total excess of F. deaths among these people over 5 years of age is largely accounted for, and this excess occurs largely between the ages of 15 and 60 years—which includes the breeding period of life. So far as tuberculosis is concerned, the Chief Sanitary Officer remarks that the disease has been steadily increasing in the district of Habana during the years following the wonderful sudden decrease which took place after the thorough cleansing out of the main sewers in 1899. He suggests the possibility that the surface of the porous floors and walls of dwellings may be converted into a culture medium for the tubercle bacillus where liquids from the subsoil ooze out of the surface.

If this be so, as seems highly probable, bearing in mind the high percentage of deaths of persons over 15 years caused by this disease, the women, who stay at home in such dwellings more than the men, are likely to be the chief sufferers, and this may be the main force which converts a distinctly virile race into one which fails to show average fertility.

In order to test this view, I have abstracted returns for six of the largest towns, one in each province, and find that the total deaths therein during 1904–6 for coloured people are in the proportion of 84·75 M. per 100 F., whereas for the whole Island the proportion for this race is 92·2 (Table XIV).

As the total number of deaths during this period in these towns is nearly one-third of the total for the whole Island for the same period, it cannot be doubted that the excessive proportion of coloured F. deaths in towns exercises a very great influence on the total results.

How great that influence is may be judged by taking a broader aspect of the question. Geographically the Island may be divided into two nearly equal parts—a western half with four provinces (Pinar del Rio, Habana, Matanzas, and Santa Clara) and an eastern half with two provinces (Camagüey and Oriente). In the western half there are 62 cities, of which 8 are large ones, with a coloured population of 342,059—roughly two-thirds of the whole; in the eastern half there are 22 cities, of which only 3 are large ones, with a coloured population of 163,484—roughly one-third of the whole (Census 1899).

The births in the western half amount to 23,202, of which the sex proportion is exactly 100 M. per 100 F., while the deaths are 21,724, in proportion 90·21 M. per 100 F. The births in the eastern half are 16,379, of which there are 100·13 M. per 100 F.; and the deaths 6198, of which there are 100·06 M. per 100 F. Thus, although the births are proportionately the same as the population for these two halves of the island—two-thirds in the west and one-third in the eastern half—and the proportion of M. to F. births is practically identical in both, the death-rate in the East is lower than it is in the west, and while in the former the proportion of F. deaths is almost exactly the same as the births, in the latter (in which most of the large cities are situated) F. suffer a much greater mortality in proportion to M. Finally, in the province of Camagüey (eastern half), where there is only one city of any importance, the population of which is 17,375, the births show a proportion of 101·86 M. per 100 F., while the deaths show 120·22 M. per 100 F.

With regard to the excess of deaths of *white* M. The highest death-rate for infants and children up to 5 years is found in the returns for the same diseases coloured children suffer from. Of these enteritis is again responsible for most deaths (M. 1365, F. 1156), but amongst whites malaria claims the fewest (M. 172, F. 186). With the exception of the latter and of bronchitis, etc. (M. 388, M. 417), all the diseases claim more M. than F. victims, and the total works out at M. 3167, F. 2518, an excess of M. 649, a proportion fairly approximate to that obtained for coloured children up to 5 years of age.

For whites above the age of 5 years, tuberculosis in one form or another is responsible for M. 1208, F. 1177, while cancer and other malignant tumours and puerperal diseases account for M. 314, F. 521 deaths. In these diseases, therefore, amongst whites there is an excess of F. deaths of only 176, whereas amongst the much smaller coloured population the excess of F. deaths amounted to 545.

The chief diseases which cause the excess of M. deaths among whites above 5 years are: diseases of the digestive system, including enteritis (M. 689, F. 383); typhoid (M. 124, F. 61); malaria (M. 244, F. 88); diseases of the nervous system (especially meningitis) and tetanus (M. 503, F. 280); bronchitis and other respiratory diseases (M. 762, F. 679); giving a total of M. 2322, F. 1491, that is an excess of M. 831 for the single year 1905.

If the interpretation I have put upon the facts is true, it is clear that an excess of F. births over deaths is not necessarily a true indication of the virility of a people, for the excess of F. adults may be gained in consequence of a high death-rate among M. (whites in Cuba). At the same time it is evident that the mere production of a large proportion of F. does not necessarily ensure a high birth-rate, for the proportion may be greatly reduced by death before their reproductive power has been fully exercised (coloured in Cuba).

That the initial virility of a race may be judged in accordance with the proportion of F. births I see no reason to doubt, but it is necessary the individual should reproduce before any practical effect can be exercised on the race.

It is important these generalisations should be borne in mind in considering the conclusions arrived at by the authorities in the last Census of Cuba (1899). They are of opinion they conclusively show the inability of a coloured race to compete with whites, but I have demonstrated the present results are largely due to sanitary conditions, and that improvement in this respect will probably revolutionise the relative fertility of the two races in Cuba, and rapidly result in great proportionate increase of the coloured population.

Sex in Relation to Provinces and Towns.

The difference between the proportion of the sexes produced by legitimate and illegitimate union has been shown to be due to individual physiological differences, while that brought about by breeding seasons is primarily induced by climatic changes.

In order to discover the existence of any influence of environment on sex I have drawn up two series of tables (Tables 44–51) on the same plan as Table XIV, the one for each year for each province, the other for the chief town in each province for each year, 1904–5–6, and have presented an abstract of the totals arrived at in Table XI for the provinces and Table XII for the towns. The results for whites and coloured people are given separately, and are all in the form of the proportion of M. per 100 F. The population of each province and each town concerned has been considered, and the proportion of white and coloured in each is noted in the tables.

The numbers dealt with in the different provinces, and to a greater degree in the different towns, vary considerably, hence there is wide variation in the results for each; especially is this the case for legitimate and illegitimate still-births, and for this reason I have not thought it worth while to give separate details for these, and have dealt only with total still-births.

Provinces: Whites.—The usual increased proportion of F. produced by illegitimate unions is evident in each province except Matanzas and Pinar del Rio, in both of which the excess of M. among illegitimate births is chiefly due to the results of 1905, which, as I have before remarked, was a specially prolific year. But according to Table XIV whites produced fewer M. that year than usual, and I have already shown that as a rule increased fertility is associated with an increased F. output for whites (Table VII).

This variation of the rule in Matanzas and Pinar is therefore of interest, and it will be seen that the returns for these provinces do show peculiarities which indicate the exercise of local influences on the proportion of the sexes produced.

The fact that the figures for illegitimate births are more irregular than are those for legitimate births is no doubt due to the much smaller number of the former in the case of whites.

The records for still-births call for no remarks.

The total production column is remarkable only for the high excess of M. in Pinar, the small excess in Oriente, and the uniform results for every other province, the death column for the low proportion of M. deaths in Pinar, and the high proportion for Oriente. The former appears to be markedly favourable, the latter as markedly inimical, to white M., and it will be observed that these pronounced differences occur at opposite ends of the Island, at the extreme west and extreme east, where very different climatic conditions prevail.

I had thought it possible this investigation might show that the occupation of F. had some general relation to the differences observed in the proportion of the sexes produced in different provinces, but as a general rule this is not apparent. Roughly speaking, the 1899 Census shows there are 490,000 white F. in the island, and of these only 1·63 per cent. are engaged in any business other than household duties in their own homes or as domestic servants. There are no doubt great differences in household work in different provinces; where agriculture is the chief interest, home life will be different from what it is where mining or fishing or manufactures prevail, but it is not justifiable, so far as I can see, with the meagre amount of knowledge I possess of the facts, to attempt to formulate any theoretical explanation of the differences, which are indeed apparent in various provinces, on any such grounds.

I have also failed to discover that the proportion of the sexes produced has any close relation to the physical characteristics of the various provinces: there is as wide variation in the results obtained for the high and hilly as for the low-lying provinces. Broadly speaking a higher proportion of M. are produced in the westerly than in the easterly provinces and more uniform results are obtained for the central provinces than for those to the east or west of them; it is quite possible, therefore, that physical conditions might be found to exercise influence if sufficiently large figures were available; as it is, however, with the exception of Pinar in the extreme west and Oriente in the extreme east, to which attention has already been drawn, the differences shown by my results are not great enough to allow of any generalisations on this head.

There is one point to which I may perhaps draw attention, and that is the prevalence of the tobacco industry in the west: it is largely confined to Pinar, Habana, and part of Matanzas. In England, I am informed, those engaged in tobacco factories are notably prone to anæmic troubles, and if this same characteristic is prevalent in these provinces in Cuba, the reduced vitality resulting therefrom may, in accordance with the theory evolved above, have some influence on the excess of M. produced in some of these districts.

It will be noticed that the highest M. death-rate occurs in two provinces in which the proportion of white population is specially low, namely, Oriente, death-rate 140·29, white population 55·29 per cent.; Matanzas, death-rate 134·22, population of whites 58·2 per cent. The lowest M. death-rate, 110·91, occurs in Pinar, where 72·6 per cent. of the population is white. Here, doubtless, occupation has great influence, and it may be remarked that while in Pinar 54 per cent. of the white M. are employed in agriculture, fisheries, etc., against 9 per cent. in trade and manufactures, in Oriente 42 per cent. are agriculturists and 17 per cent. traders, and in Matanzas 35 per cent. are agriculturists and 21 per cent. employed in trade and manufactures.

Coloured.—For coloured peoples, the numbers being fewer than for whites, the variation in the results is still wider, nevertheless certain broad generalisations may be made. In this case the illegitimate returns are more regular than those for legitimate births, the latter being numerically much the smaller of the two.

The province in which the highest proportion of coloured M. is produced, Santa Clara, is not by any means the one in which the lowest M. death-rate occurs; on the contrary, the province with the lowest proportion of M. produced is the one with the lowest M. death-rate (Habana), and this result will be seen below to be chiefly due to the marked effect of town life on the coloured F.

Pinar, again, shows a high M. birth-rate and a low M. death-rate, while in Oriente both the births and deaths are more in favour of F. Thus for coloured as for white the west is more favourable to the M., the east to the F., sex.

The central provinces give more variable results, but there is a high proportion of M. produced in Santa Clara among legitimate children, a result which is to some extent similarly indicated in the returns for whites.

Occupation, again, fails to throw any light on the variation in the sexes produced; of the 268,308 coloured F. in the Island, not more than 4·3 per cent. are engaged outside their own homes or in the capacity of domestic servants.

The highest death-rate of M. occurs in Camagüey, where the proportion of coloured population is specially low and where a large proportion of them are engaged in manufactures, while the lowest M. death-rate (apart from Habana) is in Matanzas and Pinar, in both of which provinces agriculture engages a more than usual proportion of coloured M.

When the results for total production and deaths are considered together, it is seen that Camagüey and Oriente in the east are the provinces most favourable to F., and Pinar and Habana most inimical to that sex among coloured people.

On the whole, then, there is a distinct similarity in the ratio of the figures for both races in different parts of the Island and the probability that physical conditions exert some influence on the proportion of the sexes produced is greatly strengthened, while there can be no doubt occupation has a decided influence on the death-rate of the two sexes.

Table XI.—Provinces. M. per 100 F. of Totals for Years 1904–5–6.

Provinces.	Births.			Still-births. Total.	Total production.	Deaths.	Proportion of population, 1899 Census.
	Legitimate.	Illegitimate.	Total.				
							Per cent.
Pinar del Rio . .	110·79	111·63	110·98	172·46	112·38	110·91	72·6
Habana	107·12	101·42	106·11	154·61	107·87	129·67	73·6
Matanzas . . .	105·81	110·5	106·41	165·03	107·4	134·32	58·2
Santa Clara . .	108·73	100·39	107·42	173·72	108·73	132·76	68·7
Camagüey . . .	107·71	101·01	106·49	143·3	107·29	127·4	79·8
Oriente	106·76	102·18	105·35	146·28	106·1	140·29	55·3
Total for whites .	107·78	104·4	107·14	158·87	108·42	129·76	66·9
Pinar del Rio . .	110·39	101·17	104·09	87·75	103·17	94·55	27·4
Habana	98·67	93·92	95·14	125·23	97·89	78·67	26·4
Matanzas . . .	103·91	95·12	96·79	137·24	98·68	93·04	41·8
Santa Clara . .	117·76	96·05	104·84	120·27	105·65	103·91	31·3
Camagüey . . .	106·92	96·44	101·86	109·09	102·19	120·22	20·2
Oriente	102·6	98·46	99·97	125·85	100·66	97·4	44·7
Total for coloured	106·76	96·76	100·07	121·6	101·12	92·2	33·1

Towns.—It must be recollected that here still fewer numbers are concerned, and still wider variations must be expected ; the results, however, are worthy of notice and are of special interest when compared with those obtained for the provinces, for it is here indicated that life in towns or in the country is attended by markedly different results as to the proportion of the sexes produced.

Whites.—The excess of M. produced and the low M. death-rate is evident for the town of Pinar as it was for that province, though to a smaller degree, and as the population of the town is little more than one-fifth that of the province, it is obvious the town records do not swamp those of the province, but that some physical influence, common to both country and town, is responsible for the facts.

Table XII.—Chief Towns. M. per 100 F. of Totals for Years 1904–5–6.

Chief town in each province.	Births.			Still-births. Total.	Total production.	Deaths.	Proportion of population, 1899 Census.
	Legitimate.	Illegitimate.	Total.				
							Per cent.
Pinar	110·07	95·0	107·04	196·15	109·55	115·37	66·8
Habana	104·16	99·49	103·08	145·18	105·14	141·84	71·4
Matanzas . . .	105·11	114·13	106·8	162·86	107·51	122·52	67·6
Cienfuegos . . .	102·07	89·67	99·71	225·0	102·02	167·63	64·0
Camagüey . . .	106·32	101·81	105·52	145·83	106·52	123·72	70·9
Santiago de Cuba	105·96	89·91	102·63	120·37	103·46	172·27	44·0
Total for whites .	104·8	99·76	103·76	150·83	105·44	140·28	67·1
Pinar	92·72	98·76	96·69	126·6	99·4	109·3	33·2
Habana	96·83	89·01	90·64	128·7	95·13	74·19	28·6
Matanzas . . .	103·52	103·57	103·56	220·0	106·91	80·62	32·4
Cienfuegos . . .	86·8	82·94	84·5	144·74	87·53	100·37	36·0
Camagüey . . .	114·21	90·66	101·08	100·0	101·02	124·47	29·1
Santiago de Cuba	96·82	94·12	95·33	117·47	96·52	92·7	56·0
Total for coloured	97·57	91·67	93·72	128·6	96·29	84·75	32·9

Again, the low proportion of M. produced and the high M. death-rate noted for the province of Oriente is equally obvious for its chief town, Santiago de Cuba.

The same result is apparent for Cienfuegos, the chief town of Santa Clara province, although the province itself is remarkable for a high M. birth-rate, and it may here be noted that an identical variation in the results for Cienfuegos and its province is manifest in the returns for coloured people, indicating that some special factor is exercising marked influence in the town of Cienfuegos.

Generally speaking, it is clear that the F. birth-rate is distinctly higher in towns than in provinces, while the F. death-rate is higher in provinces than in the towns. The rise in the proportion of F. births in towns is shown for both legitimate and illegitimate children (Matanzas alone excepted), and is very marked in both.

Coloured.—The numbers dealt with for this race are so much fewer than for whites, the returns cannot be utilised for detailed comparison. There is one pronounced fact however, namely that, as was the case for whites, the proportion of coloured F. born in towns is very considerably higher than is experienced in the provinces, and this is true for both legitimate and illegitimate births, as a rule. Again, Matanzas is an exception, and here also Pinar has a still more marked increase of M. among illegitimate births, but the total for towns shows a much increased output of F. for both classes, and there can be no question that life in towns is more favourable to the production of F. than is country life, for both races.

Here, again, it is impossible to explain this result on any theory of heredity, and, though I am not prepared to give adequate explanation of the cause, it is certain that some extraneous forces here demonstrate their influence on the variation in the proportion of the sexes produced by both white and coloured people when living under different physical conditions.

I am not by any means the first to draw attention to this remarkable fact, but statements founded on similar results submitted by others have been severely questioned or emphatically denied, and I venture to think the evidence I adduce here is of some value in considering the rights of the dispute.

On the other hand, unlike whites, the coloured F. death-rate is higher for towns than for provinces, and in the city of Habana this is very marked. It must be recollected, however, that the proportion of adult F. is greater in towns than in the country, and indeed the numbers concerned are in such proportion, that were it not for town life I calculate there would be no excess of deaths of coloured F.

In this relation it is of interest to note that of the 16 cities in the Island containing 8000 or more people, 10 of them are on the sea coast and contain 431,063 inhabitants, while the 6 inland cities have a population of only 76,768 (Census 1899). The climate of the towns on the low coast land being much more trying and unhealthy than that of the higher inland cities, the higher death-rate, whether of M. or F., in cities may be readily accounted for, and the particular reason for the high F. death-rate among coloured people, essentially a matter of drainage, which has already been discussed under Deaths, is emphasised.

To turn again for a moment to the variation shown in town and country. Although, as I say, I am not prepared to give adequate explanation of the cause which induces the increased production of F. in towns, I would suggest that if the view I have already advanced—which associates a mother's active vitality and good assimilating powers with the production of F.—is in the main correct, the result is probably due to the hardship of life in the country and the comparative luxury experienced in towns by the majority of the inhabitants. By luxury I do not mean solely the quality and abundance of food available, but more especially the effect of town life on the physiological habit of the average individual. It cannot be questioned that an excess of vitality and opportunity for storing superabundant nutriment are neither of them necessarily associated with what is usually recognised by dwellers in towns as a "hardy life." It is not infrequently the case that the requirements for individual existence claim the expenditure of all the vital powers possessed by the habitual dwellers in such environment. Thus it is not merely the possession of strong vitality by the mother nor her access to nutritious food which results in tense reproductive activity and the production of F. offspring, but it is the excess of her vitality, together with her power to assimilate food and the opportunity given to store and transmit it to the ovary which I maintain are the qualifications essential for such result.

I am prepared to believe that excessive luxury or indulgence is a strong bar to the physiological activity of the generative system, whereas increased healthful comfort stimulates that system ; my experience of stock breeding is strongly in favour of this view, and I suspect human beings are certainly not less affected thereby.

It is worthy of notice that the increased proportion of F. born in this and some other European countries in late years is associated with a steady migration of the country people to the towns, and may be largely due to the change of physiological habit thus brought about.

It is possible that the increased proportion of F. born in towns is influenced by an increased fertility due to town life, but whether that be so or not it is no less surely directly connected with the more favourable metabolic condition of the mother.

Summary and Conclusions.

1. *Introduction.*—The remarkable regularity in the proportion of the sexes produced by various species of animals justifies the belief that the laws of heredity in the main govern that proportion. But, notwithstanding the normal stability of the sexual ratio of offspring, variations in that proportion are continually recurring, and I maintain these variations cannot be accounted for by laws of heredity but are governed by other conditions, in the main nutritive or physical conditions, which affect both the vitality and life of ovarian ova and developing embryos either directly or through the mother which bears them.

The question as to the part the ovum and spermatozoa take in the determination of the sex of the embryo is referred to, and it is concluded that the ovum is of definite, and for vertebrates of dominant, sexuality.

It is pointed out that there is overwhelming evidence that just as female larvæ are less able to resist hardship and want than male larvæ, so want, privation, and unfavourable climatic conditions are consistently correlated with an increased production of M., while prosperity or a plentiful supply of nutritive food and favourable physical conditions are associated with an increase of F. births.

The evidence I have to offer substantially confirms this view.

Attention is drawn to the fact that in dealing with mammals we are concerned with animals who produce only a very limited number of the ova stored in the ovary during their whole life, that many of them degenerate and are absorbed, and that it is certain a struggle for existence takes place among these ova.

This is a fact of great importance, for if the ovary experiences the effects of influences which bear upon selection, forces are there introduced which will not only bear upon sex but also upon every hereditary constitutional variation which is directly associated with the vigour of the ovum. Natural selection.

I suggest that such struggle results in the increased production of M. or F. ova according to the physical conditions which prevail from time to time, and conclude that in all animals in which only a limited number of ovarian ova come to maturity selective action takes place in the ovary, and that the growth and maturation of M. or F. ova are directly influenced by such physical conditions as affect the quality or quantity of nutriment supplied to the ovary.

If this be so, the most prominent place in all questions concerning the sex ratio of children is occupied by women, and it is with women this paper essentially deals.

The main results arrived at below are, I believe, strongly confirmatory of the views here set forth.

2. *The Material dealt with.*—The returns dealt with are derived chiefly from the Census of Cuba, 1899, and the monthly and annual reports of the Chiet Sanitary Officer of Cuba, Dr. Finlay, for the years 1904–5–6. They are concerned with two races, whites and coloured people, and are kept distinct for each.

3. *The Tables.*—In compiling these returns, figures were included for each month of each of these three years, and for the yearly total; they were tabulated under headings of Marriages, Births—legitimate and illegitimate—Total Births, Still-births —legitimate and illegitimate—Total Still-births, Total Production, and Deaths. Under each of these headings M. and F. were separately entered, and for all except Marriages the totals for M. and F. were added, and the proportion of M. per 100 F. calculated. All these details were supplied for whites and coloured people separately, for each of the six provinces, and a grand total was added.

From this mass of detail, occupying 51 Tables, the returns for each year and the totals for the three years were tabulated for whites and coloured people separately, and this information with the grand total is presented here in Table XIV.

Twelve other tables appear in the text (Tables I–XII) to elucidate various special problems, and these were compiled from material obtained from the above and various other sources.

4. *Population.*—The Report of the Census of Cuba, 1899, shows an excess of M. among whites and an excess of F. among coloured peoples.

The distribution of the population regarding race, provinces, and sex is shown. (Tables I, II, and III.)

5. *The Proportion of the Sexes produced by Whites and Coloured People in Cuba. Births: Whites.*—An excess of M. births is shown, which is higher for legitimate than for illegitimate births. Total births, 107·14 M. per 100 F.

Coloured.—An excess of M. is shown for legitimate and an excess of F. for illegitimate births, in such proportion that the total births are practically equal as regards sex, 100·07 M. per 100 F.

This marked variation in the proportion of the sexes born by the two races is practically of uniform occurrence throughout my tables. The general tendency of the coloured people to produce a larger proportion of F. than the white race is considered to be a racial characteristic governed by laws of heredity, and this view is supported by records for negroes in other countries.

The comparatively high proportion of M. born by white women is shown to be similar to that recorded for Spain, from whence most of these people had their origin, and is again a racial characteristic.

6. *Still-births: Whites.*—Here there is a higher proportion of M. than is recorded for births, and it is greater among legitimate than among illegitimate embryos.

Coloured.—The same general statement applies, but the excess of M. is nothing like so high as in whites. These results show that M. children are more difficult to bear and rear than F. children for both races, but that white women experience greater difficulty than coloured women in this respect. Children who die under 24 hours old are included in this return.

7. *Illegitimacy.*—The increased proportion of F. born in consequence of illegitimate union is consistent in the totals for each year for each race; with the exception of one year for whites (1905) the same is true for still-births, but when still-births are included with births the difference is slightly reduced (Table IV).

A comparison is drawn between these returns and those published for other countries, and it is found that the relative increase of F. produced by illegitimate as compared with legitimate unions is greater in Cuba than is shown in the statistics of other countries, and this is in spite of the inclusion of still-births in the former.

It is pointed out that, as there is usually a marked excess of M. among first-born children, and as a large proportion of illegitimate children are first-born, the increased proportion of F. produced by illegitimate union is still more remarkable.

The fact that illegitimate unions give rise to the birth of an increased proportion of F. children has long been known; the inclusion of still-births now enables me to show that illegitimate *unions* result more often in the *conception* of F. than legitimate unions, and that this fact must be regarded as a law of sex production.

From these facts it must be concluded that heredity can have no bearing on the variation in the proportion of the sexes produced by legitimate as compared with illegitimate unions, and that we have here certain evidence of the influence of extraneous forces on the proportion of the sexes produced.

The question as to the nature of these forces is discussed, and it is concluded that the main factor which influences the increased production of F. in this class of union is an exceptionally active metabolism of the mother, which favourably affects the development and ripening of those ovarian ova which give rise to F. embryos.

The increased production of F. in consequence of illegitimate union is exceptionally great for whites in Cuba, while for coloured people it is without parallel in any country the statistics of which I have seen, except Greece.

It is shown (Table V) that the proportion of the sexes born is more stable in the legitimate births for whites, and in the illegitimate births for coloured, and it is concluded that the forces which induce this difference are differently distributed in the two races. Further reference is made to this point under the heading of Breeding Seasons.

It is also shown that the increased production of F. in consequence of illegitimate union is not due, as might be supposed, to crossing.

8. *Total Production.*—The effect of the inclusion of still-births in the returns is to increase the average proportion of M. per 100 F. produced by whites by 1·28, while for coloured people the increase is slightly less, being 1·05; it may be assumed, therefore, that from 1 to 1·3 is the amount which should be added to the proportion of M. born in any country in order to arrive at the M. productive capacity of that people.

As the total population shows an excess of M. among whites while an excess of M. white children are produced, and an excess of F. among coloured people while the M. and F. children are produced in practically equal proportions, these figures do not substantiate the view that the sex produced in excess is always that which is in a minority among the adult population.

9. *Marriages.*—The time of year when most marriages take place is during the hot weather; July and August are the months for whites as a rule: for coloured the actual maximum of marriages is more irregular but occurs about that time of year. Fewest marriages take place in the early spring, during the cold weather (Table VI).

10. *Breeding Seasons.*—In Table VI is recorded the dates each year when the highest and lowest number of marriages, total births, and illegitimate births take place, and under each heading white and coloured are entered separately. For both races there is one period of the year when a specially high birth-rate always occurs, namely, in July; there is also a second period when a rise takes place in the birth-rate, as a rule only slightly marked, but in 1905 strongly marked, namely, November–December. There are, in fact, two annual periods when most conceptions occur, or two annual breeding seasons, the autumn and the spring breeding seasons, giving rise to the high birth-rates in July and November–December respectively. In the case of both races the increased birth-rate is sudden and must coincide with a sudden burst of reproductive activity.

For whites the seasons are somewhat more sharply marked than for coloured. For whites the autumn breeding season is November, the spring breeding season is March–April. For coloured the autumn season may extend from November to December, while the spring season is the same as for whites, March–April.

For both races the autumn season is the most sharply marked and the most regular; the spring season was specially pronounced in 1905, and that year was a specially prolific one (Table XIV).

The fewest births occur in January–February each year, while in 1906 there was another even more marked drop in the birth-rate, in September–October. The time when fewest conceptions occur, therefore, is May–June. This result is the same for both races.

The records of illegitimate births closely accord with those for total births in these respects, and as the proportion of illegitimate births for whites is 18·27 per cent., and for coloured 65·78 per cent. of the totals for each race, this agreement is strong evidence of the natural occurrence of these breeding seasons.

It is shown that the marriage season has no relation whatever to the breeding seasons, and the conclusion is inevitable that the inhabitants of Cuba are subject to influences which have a specially stimulating effect upon the reproductive system at certain times of the year.

An examination of monthly records of barometric pressure, temperature, and relative humidity shows that the breeding seasons coincide with the times when a marked change of climate occurs. In the autumn season the change is from hot to cold weather, in the spring season from cold weather to the first advent of spring, and the conclusion is drawn that these abrupt climatic changes are conducive to a similarly abrupt increase of metabolic activity resulting in a rapid stimulation of the reproductive system.

It is not claimed that these climatic changes themselves are the sole cause of the breeding seasons, but it is demonstrated that they are associated with pronounced reproductive activity, and that the latter is essentially governed by the resultant of the various forces induced by a marked change of climate.

11. *The Proportion of the Sexes produced at Times of Highest and Lowest Birth-rate as compared with the Average Proportion for the whole Year.*—If I am right in my conclusions that variation in climate and food and their variable effect upon the metabolic activity of the mother exercises influence on the ripening and production of ovarian ova of different sexes, the results of the breeding seasons should have bearing on the problem of sex production. This is shown to be the case in Cuba. For both white and coloured the proportion of F. born at times of highest fertility is markedly in excess of the proportion born at times of lowest fertility; that is to say, F. are born in greater excess when the metabolism of the mother is most active.

This is true for both races, and is shown for all totals and for each individual month, except two months in 1905 for coloured people (Table VII).

Here, then, is another instance of the power of extraneous forces to influence the proportion of the sexes produced, and another instance of variability in the sex ratio which cannot be ascribed to the exercise of any law of heredity.

It is further shown that while whites show a marked sensibility to the influences which induce the production of F., coloured people are much more influenced by the forces which stimulate the production of M.

This result is interpreted to mean that as the tendency of whites to produce M. is normally exercised to a high degree, this race has less power to respond to the influences which tend to increase the M. output, whereas forces which favour the production of F. have more effect. For the same reason coloured people, who normally produce a large proportion of F., most readily respond to those forces which induce the production of M.

The force of this reasoning is emphasised by the fact that, when the high birth-rate persists for two months, whites produce the maximum of F. during the first month, the influence acts quickly; while in coloured people the impulse is strongest in the second month, in other words the tendency is cumulative in their case.

12. *The Proportion of the Sexes produced by Legitimate and Illegitimate Unions at Times of Highest and Lowest Fertility as compared with the Average Proportion.*—There is a consistent difference between the proportion of M. born from legitimate as compared with illegitimate unions, and the inference has been drawn that the forces which induce that difference act differently in the two races. This inference was shown in the last section to be justified for births as a whole, and here the same fact is again demonstrated. The proportion of M. is higher at times of lowest fertility than during breeding seasons, but the difference is greater for coloured than for whites (Table VIII). It is also shown that the higher proportion of F. produced by illegitimate unions is greatest during breeding seasons for whites but not greatest during those months, but directly after them, for coloured.

This variation is capable of the same interpretation advanced in the last section. The forces which act on whites in favour of the production of F. are short-lived, while for coloured it is cumulative, and the reverse is the case for M.

The phenomena described in the last two sections are instructive. They show an obvious inclination towards a mean sex ratio and are indicative of a strain. It would appear that the forces which induce the production of a high proportion of M. or F. are limited and are not of the nature of hereditary forces, but that they are indeed controlled within certain variable limits by a stronger law which makes for some point near equality of the sexes and which is, I take it, the force of heredity.

This exemplifies the nature of the claim I make for the effect of extraneous agencies on the sex ratio: they undoubtedly exist and are surely exercised, but are to some extent subordinate to hereditary laws; at the same time they cannot be ignored and are certain to interfere with the performance of those laws and with all calculations based solely upon such laws.

13. *Deaths and their Influence on the Sex Problem.*—Among whites a large excess of M. die, among coloured more F. than M. die, a result, no doubt, to some extent, due to the excess of M. in the white and of F. in the coloured population. But for whites the M. death-rate is so excessive that the net increase is in favour of F., while for coloured the high F. death-rate swamps the high F. birth-rate, and the net increase is now in favour of M.

It has been stated that the birth of a high proportion of F. is sure indication of the well-being of a nation, but in the case of coloured people in Cuba the high F. death-rate annuls the advantage and gives it apparently to the whites, who are naturally less fitted to thrive in the climate of that island.

It is shown that an excess of F. gained at the expense of the M. is not really an advantage, and investigations demonstrate that the high F. death-rate among coloured occurs during the ages of 15–60, and is chiefly due to tuberculosis caused by faulty sanitary conditions. It is pointed out that improvement in this respect will probably convert the coloured people into the dominant race in Cuba.

14. *Sex in Relation to Provinces and Towns.*—Variations in the normal relations of the sexes born are noted for certain provinces, and the exercise of local influences on the proportion of the sexes produced is there indicated (Table XI).

Neither the occupation of F. nor the physical characteristics of the various provinces uniformly affect the question to any extent, but it is shown that, broadly speaking, a higher proportion of M. are born in the West than in the East provinces, and more uniform results are obtained from the Central provinces of the Island.

There is a distinct similarity in the sex ratio shown by the figures for both races in these different parts of the Island, and the probability that physical conditions exert influence on that ratio is strongly inferred.

When the records for towns are compared with those for the country, however, there can be no doubt as to the result. The proportion of F. born in towns is very considerably higher than is experienced in the provinces (Tables XI, XII), and this is true for whites as well as coloured, and is evident, as a rule, in legitimate and illegitimate birth records.

A suggestion is made as to the causes, associated with the metabolic activity of the mother, which bring about this result, but it is not claimed to be a fully adequate explanation.

The fact, however, remains, and this is a third example of the exercise of extraneous forces on the proportion of the sexes produced and, so far as I can see, of the failure of any theory of heredity to account therefor.

Thus this investigation shows that extraneous forces may influence the proportion of the sexes produced, and it is clear that the hereditary tendency of any race or species to produce the sexes in certain proportion may be radically interfered with by a great variety of circumstances.

In dealing with human beings living under civilised conditions, such interference can only be comparatively slight, and the comparatively small differences recorded under some headings of this paper may be judged by some to be inconclusive. I think, however, it cannot be denied that the main points of difference I have set forth are so consistently exhibited for both the white and coloured races in Cuba, and the variations in the proportion of the sexes produced are so intimately associated with factors which undoubtedly affect the metabolic activity of the women, that they must be accepted as valid evidence of the fact that physical, and especially nutritive, conditions do affect the ratio of the sexes of offspring, and may override the hereditary tendency of the race in this respect.

But if this be true for women it must also be true for all animals in which the ripening of the ovarian ova is subject to selective action. There is some evidence, though it is for the most part incomplete, that this process goes on in the ovary of animals other than mammals (amphibia, fishes, and some invertebrata), and I am strongly disposed to believe it will be found that the proportion of the sexes produced by *all* animals is to some extent thus influenced.

But, as the proportion of the sexes produced exercises a very great influence on the power of a species to thrive, this struggle for existence among ovarian ova, this influence of environment projected into the ovary itself, is a potent factor, influencing the power of a species to persist in any special locality, and, indeed, influencing its ultimate power to exist at all. Thus, for instance, the great variations observed in the size of the vast shoals of herrings round our coasts may be, to no slight extent, governed by this factor, and a great variety of similar phenomena, such as the appearance in large numbers or the disappearance of various species of insects, may be brought about by the same means.

Finally, it must be concluded that as nutrition and other extraneous forces introduce factors to the ovary which result in a variable environment for the ovarian ova and cause a struggle for existence and a process of selection to occur amongst them, it follows that, as these forces do actually cause a variation in the proportion of the sexes produced, such proportion cannot be wholly governed by any law of heredity. At the same time, as it must be admitted that heredity does exercise fundamental influence on the proportion of the sexes of primitive ovarian ova, it is clear that the performance of the laws of heredity may be subject to modification by extraneous forces.

I have here dealt only with sex, but this generalisation suggests that it is not improbable the nature of the supply of nutriment provided for the ovary, and the conditions under which it is supplied, may affect other than the sex qualities of the ovarian ova. It indicates the probability that the proportionate production of individuals possessing various kinds of different characters may be similarly influenced. Especially would this factor bear on disease or the inherited tendency to disease, and I am of opinion it is highly probable that the scientific feeding of the female, in anticipation of motherhood, will be found to be of extraordinary value as an agent for the conveyance of appropriate nourishment to weakly ova, for the selection and ripening of healthy ova, or for preventing the maturation of ova bearing the active germs of disease.

The results arrived at from previous work on œstrus and menstruation have already induced me elsewhere to emphasise the great importance attached to the study of the comparative physiology of the generative system. The sensitiveness of the generative system to variation, especially in relation to the powers of reproduction of a species, was insisted upon by Darwin, and has since been elaborated by many of his followers and by others; but, so far as I know, the deduction here drawn, that the forces of environment and of selection act directly upon the ova in the ovary, has not hitherto been pointed out, and is of interest inasmuch as the field for research in this department of Biology (generative physiology) is still further widened, becomes, indeed, of fundamental importance to all students of heredity, and must bear upon that greatest of all problems, the advancement of the human race.

Postscript.

Since the foregoing pages were written, I have received records of the births, legitimate and illegitimate, recorded for each year from 1900 to 1906 in Cuba. These records I have summarised in the following Table XIII.

The figures giving the proportions of M. per 100 F. during this period of seven years agree in the main with the characteristics shown by those already tabulated for the three years 1904–6. Thus the M. per 100 F. in the totals for whites (106·46), for coloured people (100·82), and for the grand total (105·5), are practically the same as the figures given in Table XIV, and it may be concluded the latter are essentially representative of the main sex producing characteristics of the two races inhabiting Cuba.

Table XIII.—Total Legitimate and Illegitimate Births—Whites and Coloured Peoples. Cuba, years 1900–1906.

Race, etc.	M.	F.	T.	M. per 100 F.
Whites, legitimate births . . .	114,851	106,734	221,585	107·6
„ illegitimate births . . .	30,166	29,481	59,647	102·32
Total	145,017	136,215	281,232	106·46
Coloured, legitimate births . . .	13,950	13,188	27,138	105·78
„ illegitimate births . .	31,506	31,900	63,406	98·74
Total	45,456	45,088	90,544	100·82
Grand total	190,473	181,303	371,776	105·05

In detail, however, certain differences are apparent which demand notice. The totals for the seven years' records show a decreased proportion of M. for whites and an increased proportion of that sex for coloured people, and this variation occurs chiefly among illegitimate births for both races, that is among the class of union which is most susceptible to any variation in physical conditions.

The period now added to my original investigation comprises the four years during which the effects of the war were most poignantly felt, and I suspect the chief cause for the variation is to be found in the conditions of life so produced. It must be recollected also that during those first four years the machinery for collecting statistics was less complete than it was for the later three years, and that this was specially the case for the country districts, and therefore for the coloured people who chiefly inhabited those portions of the Island.

I am not in possession of sufficiently full details to enable a complete comparison to be made between these two periods ; the chief fact of importance to be gathered is that for the whole seven years, 1900–6, there were 21·21 per cent. of illegitimate births for whites (2·49 per cent. more than for the last three years), and 70·72 per cent. for coloured people (4·94 per cent. more than for the last three years).

Thus it is clear the social condition of the country in the early years after the war was different from what it became later and, so far as whites are concerned, in accordance with the views already expressed, the increased prevalence of illegitimacy in the towns will largely account for the increased proportion of F. births under that head.

For coloured people it will be seen there is an increase ot 0·98 F. for legitimate births during the whole seven years (compare Tables XIV and XIII), and a decrease of 1·98 for illegitimate births during that period.

In the absence of details which would throw light upon the results of the special breeding seasons for 1900–3 and enable a comparison to be made of the relative numbers of coloured people in towns and in the country during those years, it is not possible to express a definite opinion of the causes which operated to bring about this variation. It is quite certain that during, and for some time after, the war, there was great hardship and want experienced in the country districts, and that these factors affected the coloured people, who chiefly inhabited the country at that time, more than the whites, who were then largely confined to the towns.

This fact, which I have already shown is a potent agent in favour of the production of M., taken in conjunction with the racial characteristics of these people pointed out above, namely, that circumstances which tend to act in favour of the production of M. will act with exceptional force on them, may be sufficient to account for the variation ; I am inclined to think it is so, but in default of adequate details am obliged to leave the matter there.

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Table XIV.—The Proportion of the Sexes produced by Whites and Coloured Peoples in Cuba, Years 1904–5–6, and Totals.

Race.	Year.	Marriages.		Births.								Total Births.				Still-births.								Total Still-births.				Total Production.				Deaths.			
		M.	F.	Legitimate.				Illegitimate.				M.	F.	T.	M. per 100 F.	Legitimate.				Illegitimate.				M.	F.	T.	M. per 100 F.	M.	F.	T.	M. per 100 F.	M.	F.	T.	M. per 100 F.
				M.	F.	T.	M. per 100 F.	M.	F.	T.	M. per 100 F.					M.	F.	T.	M. per 100 F.	M.	F.	T.	M. per 100 F.												
Whites	1904	9,581	9,515	16,295	15,154	31,449	107·53	4,062	3,893	7,955	104·34	20,357	19,047	39,404	106·88	517	306	823	168·95	186	118	304	157·63	703	424	1,127	165·8	21,060	19,471	40,531	108·16	8,479	6,538	15,017	129·69
	1905	11,987	11,891	20,454	19,219	39,673	106·42	4,908	4,790	9,698	102·46	25,362	24,009	49,371	105·63	646	412	1,058	156·79	218	134	352	162·68	864	546	1,410	158·24	26,226	24,555	50,781	106·8	9,975	7,688	17,663	129·75
	1906	9,913	9,834	18,785	17,151	35,936	109·53	3,627	3,383	7,010	107·21	22,412	20,534	42,946	109·14	769	479	1,248	160·54	217	158	375	137·34	986	637	1,623	154·79	23,398	21,171	44,569	110·52	10,963	8,444	19,407	129·83
Totals . .	—	31,481	31.240	55,534	51,524	107,058	107·78	12,597	12,066	24,663	104·4	68,131	63,590	131,721	107·14	1,932	1,197	3,129	161·4	621	410	1,031	151·46	2,553	1,607	4,160	158·87	70,684	65,197	135,881	108·42	29,417	22,670	52,087	129·76
Coloured . . .	1904	2,132	2,198	1,896	1,813	3,709	104·58	4,071	4,160	8,231	97·86	5,967	5,973	11,940	99·9	77	59	136	130·51	289	238	527	121·43	366	297	663	123·23	6,333	6,270	12,603	101·0	3,804	4,210	8,014	90·35
	1905	3,041	3,137	2,703	2,542	5,245	106·33	5,003	5,170	10,173	96·77	7,706	7,712	15,418	99·92	122	85	207	143·53	316	255	571	123·92	438	340	778	128·82	8,144	8,052	16,196	101·14	4,609	4,817	9,426	95·68
	1906	2,425	2,504	2,394	2,195	4,589	109·07	3,728	3,901	7,629	95·56	6,122	6,096	12,218	100·43	122	95	217	128·42	307	282	589	108·86	429	377	806	113·79	6,551	6,473	13,024	101·2	4,960	5,477	10,437	90·56
Totals . .	—	7,598	7,839	6,993	6,550	13,543	106·76	12,802	13,231	26,033	96·76	19,795	19,781	39,576	100·07	321	239	560	134·31	912	775	1,687	117·68	1,233	1,014	2,247	121·6	21,028	20,795	41,823	101·12	13,373	14,504	27,877	92·2
Grand totals . .	—	39,079	39,079	62,527	58,074	120,601	107·67	25,399	25,297	50,696	100·4	87,926	83,371	171,297	105·46	2,253	1,436	3,689	156·89	1,533	1,185	2,718	129·37	3,786	2,621	6,407	144·45	91,712	85,992	177,704	106·65	42,790	37,174	79,964	115·11

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